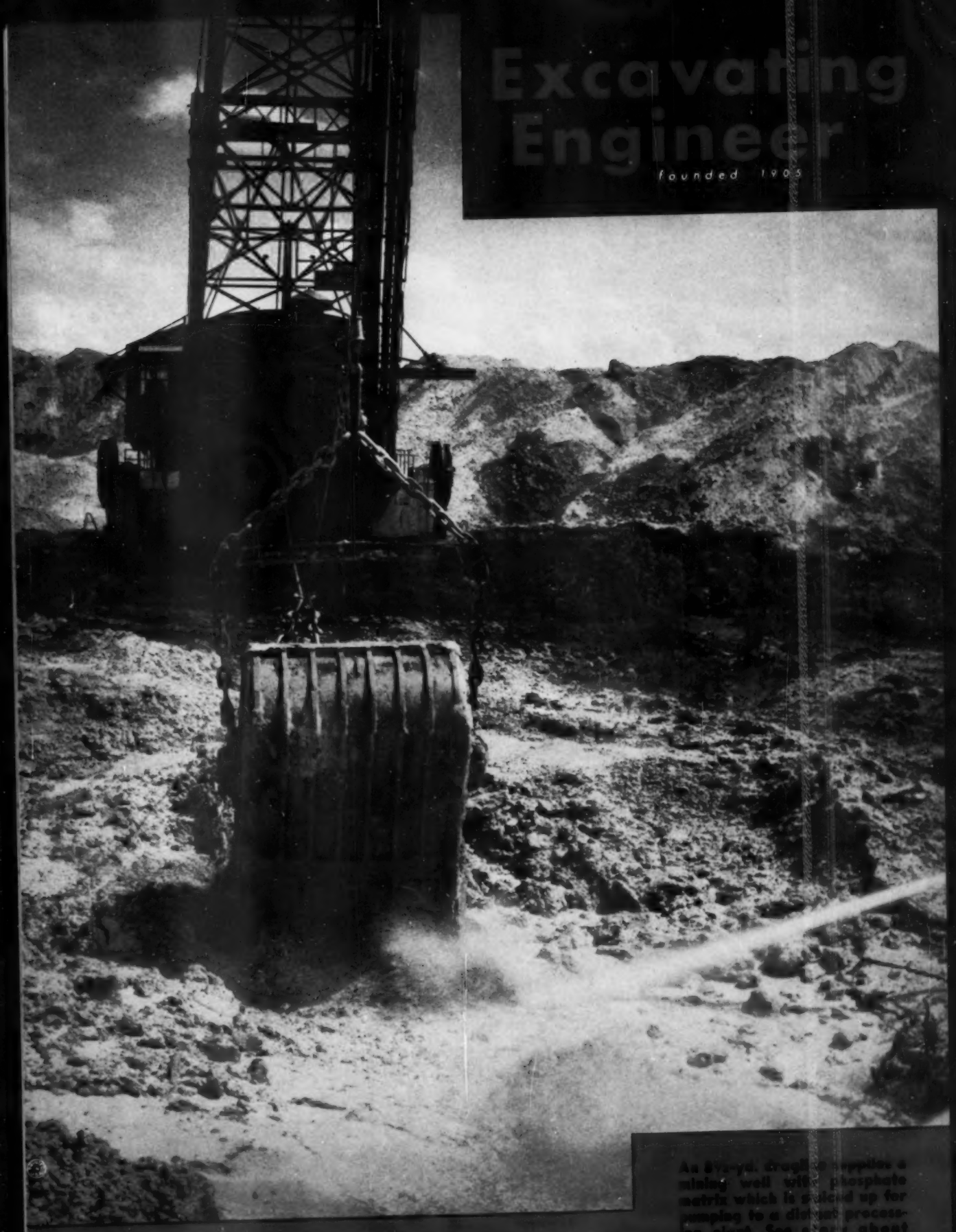
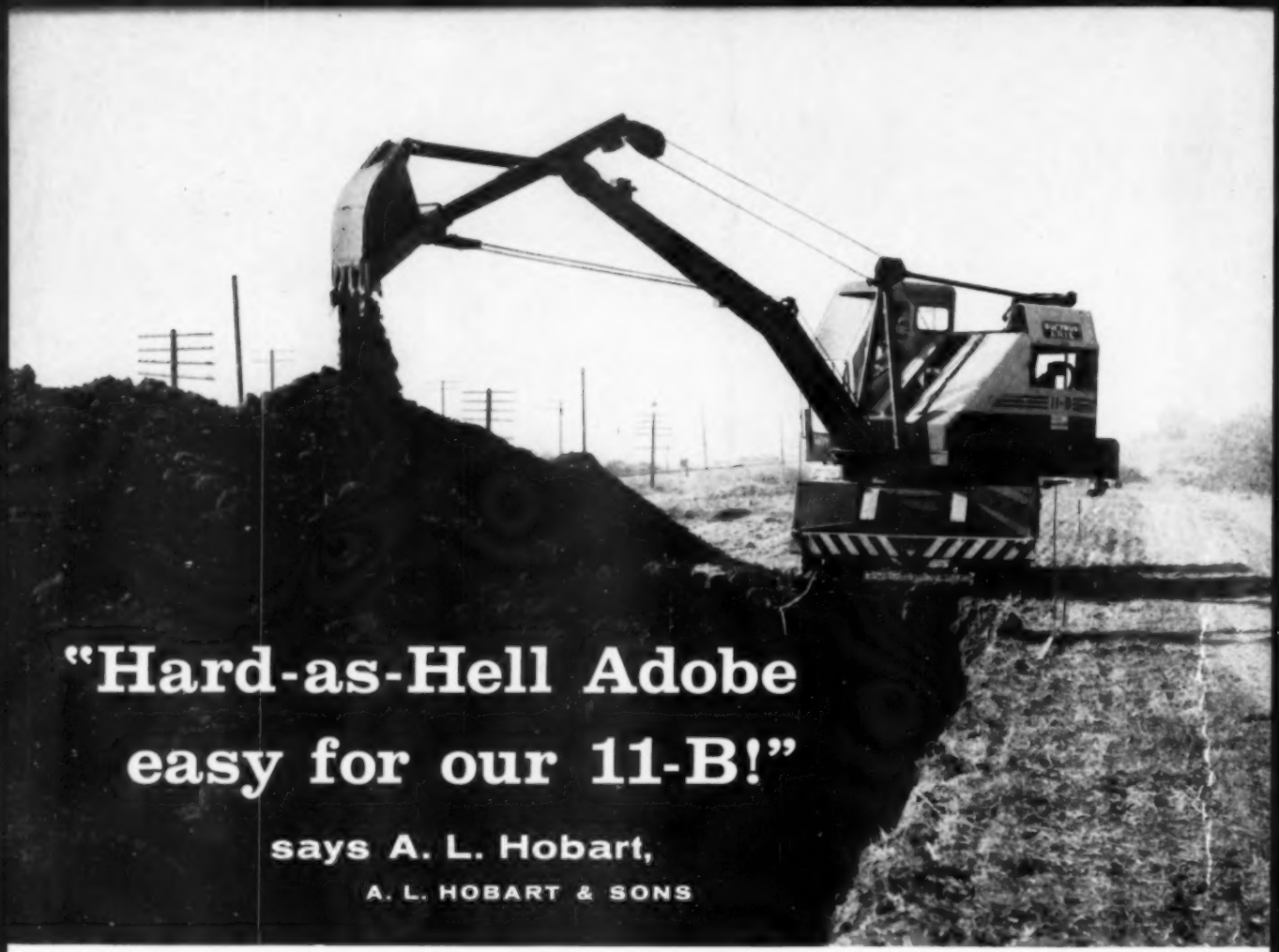
Excavating Engineer

founded 1905



As 8½-yd. dragline supplies a mining well with phosphate matrix which is sluiced up for pumping to a distant processing plant. See story about Florida's Coronet Phosphate Co. on page 25.

NOVEMBER 1959



"Hard-as-Hell Adobe easy for our 11-B!"

says A. L. Hobart,

A. L. HOBART & SONS

Hobart averaged 200 lineal feet of 12-ft-deep, 5½-ft-wide trench every 8-hr shift on this pipeline relocation job near Walnut, California, digging in "hard-as-hell adobe!"

Hobart's reaction to the new Bucyrus-Erie 11-B is typical, and here are more reasons why:

The 11-B hoe has the extra range owners have needed so long — digs 17 feet down . . . reaches out 26 feet, 9 inches to put dirt farther away from the trench, loads trucks easily, makes fewer moves per day.

The 11-B's exclusive, variable pitch dipper action gives you as much as 10% more level floor, changes the pitch of the dipper continually as you dig.

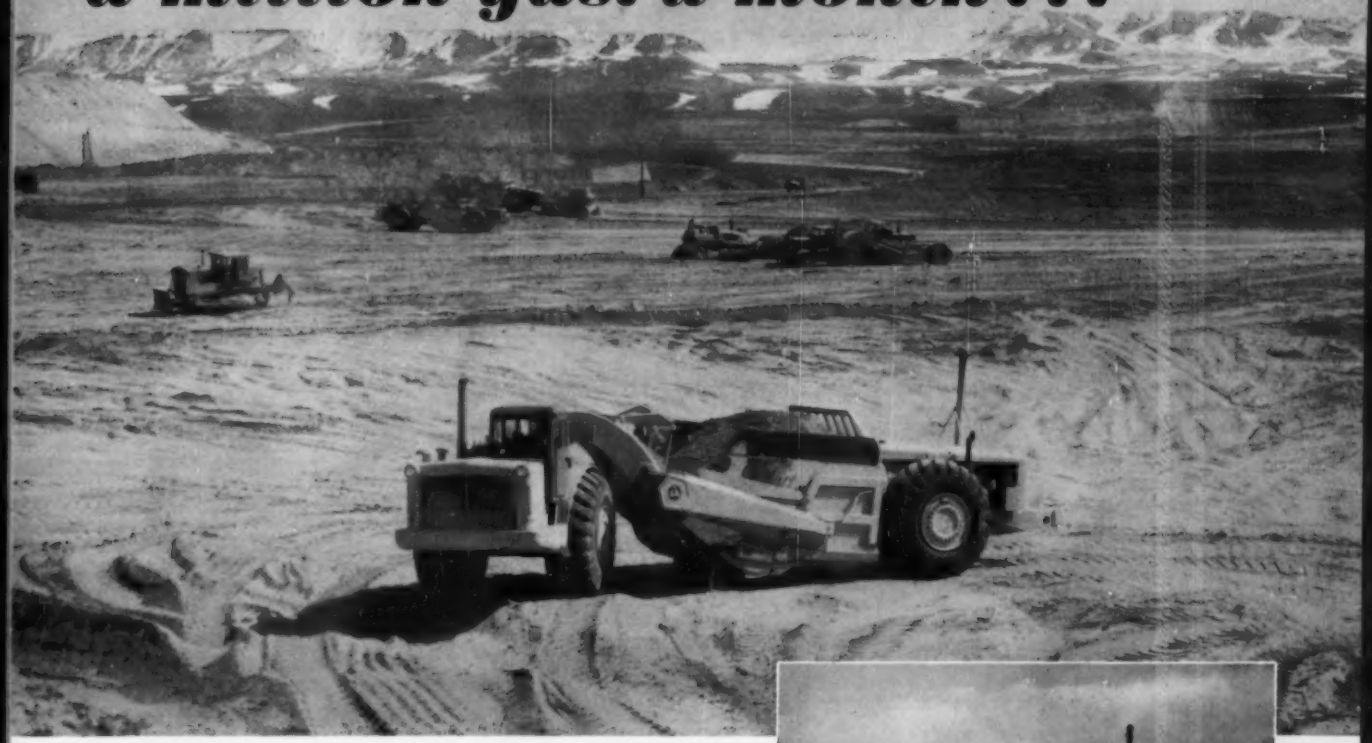
Easy to maintain? The 11-B has more time- and energy-saving maintenance features than any other crane in its class, including a color-guide lube system, automatic gear lubrication, pre-lubricated ball bearing swing circle with nothing to adjust, no bushings to replace.

Get the complete 11-B story from your distributor, or write Bucyrus-Erie Company, South Milwaukee, Wisconsin, Dept. 22-EA

BUCYRUS ERIE®

Builds Better Equipment

a million yds. a month...



moved by Euclid "Twins"

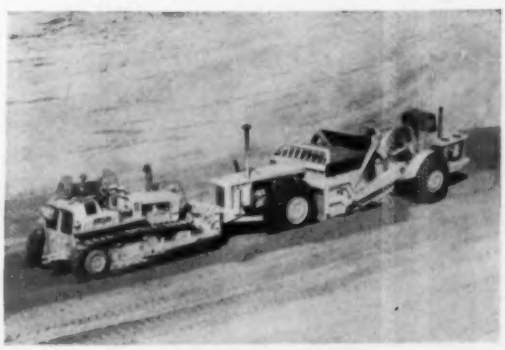
At a mining operation in central Wyoming, a fleet of 18 Euclid scrapers is removing overburden from uranium ore at a rate of a million cu. yds. a month... nearly 21 million cu. yds. will be moved to uncover the ore body. It's a big, tough job to move that quantity of heavy sand over a mile of adverse grades up to 12%.

Maco Construction Co. of Rawlins, Wyoming, contractor on this stripping project, bought 12 Twin-Power "Euc" Scrapers of 24 yd. struck capacity to maintain high speed production. With two engines and all-wheel drive, these scrapers have the power and traction needed to move big loads up steep grades from pit to dumping area. Twin-Power is paying off in the big performance of Maco's five TC-12 Euclid crawler tractors, too—they're used for push loading this all-Euclid fleet of scrapers.

Wherever big tonnages must be moved on mine, quarry, industrial and heavy construction work, Euclid equipment provides more work-ability and better return on investment. The dealer in your area will be glad to supply facts and figures on Euclid rear-dump and bottom-dump haulers, scrapers, crawler tractors and front-end loaders.

EUCLID Division of General Motors, Cleveland 17, Ohio

Big power and big capacity pay off in big production... Euclid TC-12 Crawler Tractor has 2 engines that deliver 425 net h.p.... "Twin" Scraper of 24 yd. struck capacity also has 2 engines (563 total h.p.) and all-wheel drive with separate Torqmatic Drives for each axle.



GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

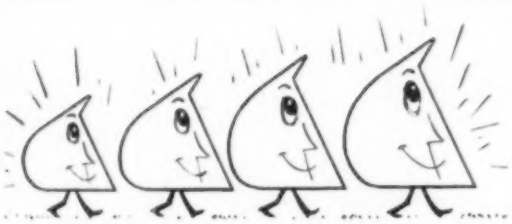
When is a 2-yd Loader *Not a 2-yd Loader?*

. . . Simply when it operates over or under carrying capacity. The right combination to peak production and longer loader life is the right size bucket on the right size loader.

That's why Allis-Chalmers offers a wide selection of buckets for each of the TL-14, TL-16 and TL-20 TRACTOLOADERS. You choose the size that's just right for the weight of materials you handle and your job operating conditions.

Some buckets are too big . . . others too small

Using a bucket that's too big for the material you handle can cause excessive repairs and downtime . . . using one that's too small costs you money because you're not getting all you can out of your loader. That's why you should select your bucket/loader by carry capacity. For example, with the TL-20 which has a 9,000-lb carry capacity, you could use a 3-yd bucket in materials that weigh 3,000 lb. You could use a 5-yd bucket with materials that weigh 1,800 lb.



Fit the bucket to the job

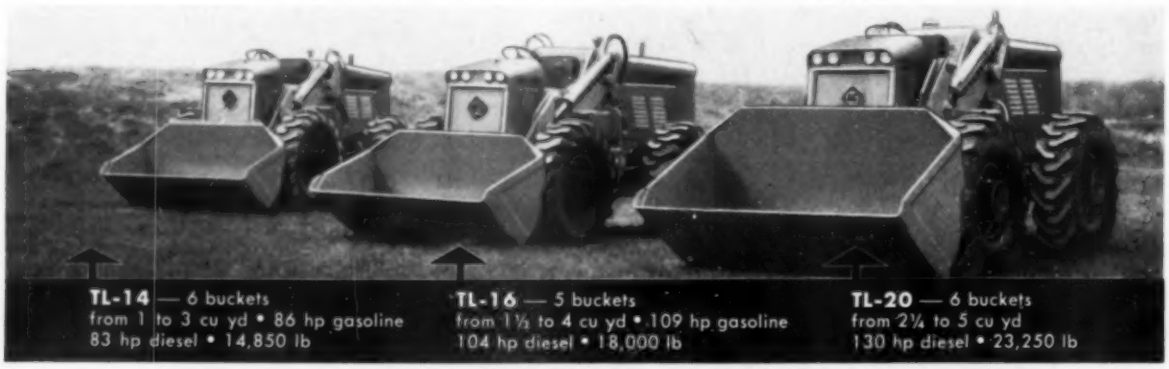
Whether you're working good, level terrain, swampy ground or hilly country, there's a right loader and bucket combination for your material needs . . . your operating conditions. Choose from 17 bucket/loader combinations.

BOTH *loader and bucket* have to be tough

. . . or the most efficient selecting in the world won't help! That's why Allis-Chalmers offers such outstanding features as extra-high spill guards . . . double-bottom bucket and replaceable wear plates — why TRACTOLOADER axles are pin-connected directly to the frame with 2-inch-diameter steel pins instead of the usual U-bolt method. There is no rolling or shifting under load — no bolts to work loose, no mounting plates to warp out of shape.

Your Allis-Chalmers construction machinery dealer can assure you longer loader life . . . more consistent production year after year than anyone else. His products are by-products of experience — backed by first-line quality parts and good service.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN



TL-14 — 6 buckets
from 1 to 3 cu yd • 86 hp gasoline
83 hp diesel • 14,850 lb

TL-16 — 5 buckets
from 1½ to 4 cu yd • 109 hp gasoline
104 hp diesel • 18,000 lb

TL-20 — 6 buckets
from 2¼ to 5 cu yd
130 hp diesel • 23,250 lb

move ahead with ALLIS-CHALMERS

...power for a growing world

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Excavating Engineer

founded 1905

South Milwaukee, Wisconsin

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Stringing out dynamite sticks on top of thin, tough rock layer breaks material.

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Florida firm which began operations 50 years ago with steam shovels now uses three draglines to move 7 million yards of material annually. Swamp clearing and draining is major problem.

Dredge Uses Aluminum Anchors—by John W. Anderson 30
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3 HIGH-PRODUCTION CAT

MOTOR GRADERS...to fit *any* job!

HERE THEY ARE—Caterpillar's three modern, heavy-duty Motor Graders. Each is designed to outwork any machine of comparable size. Each is ruggedly built to deliver unequaled availability under the toughest conditions. Pick the one that meets your job needs—and you can count on it to do a whale of a job for you.

The No. 14, the industry's first and only Turbocharged Motor Grader, is the most versatile BIG grader ever developed. It operates at the highest practical working speeds with either a 12-foot or 14-foot moldboard. Built to handle the biggest jobs, it will deliver profitably for you on many applications. For example:

1. Power Applications like heavy grading, heavy ditching, rough grading and bank sloping.

2. Control Applications like light spreading, surface maintenance, fine grading and light blading.

The No. 12, known for more than 20 years as the "standard of the industry," has recently been improved to increase its superiority over similar-size graders. Here are some improvements that contribute to its greater capacity:

1. Clearance between the top edge of the blade and bottom edge of the circle has been increased to provide improved rolling action, allow more material to move across the blade.

2. Blade Thickness has been increased and blade beams have been increased in length and thickness to handle heavier loads.

3. New Mechanical Controls for reduced kickback, easier engagement.

4. New Blade Controls feature a positive mechanical lock—exclusive with Caterpillar. When control is in neutral, the power shaft is locked by a set of gear teeth to prevent creeping.

The No. 112 has also been improved recently—including the new blade controls mentioned above. Use the No. 112 on smaller jobs—none can touch it for efficient performance!

These are just some of many features that put Cat Motor Graders out front with higher production at lower operating cost. For the complete picture, see your Caterpillar Dealer. Ask him to demonstrate—just say when and where, he'll be there!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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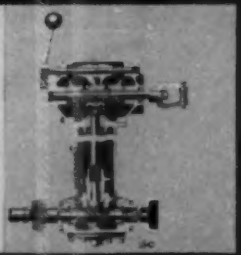
MODERN HEAVY-DUTY MACHINES TO FIT ANY JOB!

HIGH-PRODUCTION FEATURES OF CAT MOTOR GRADERS!

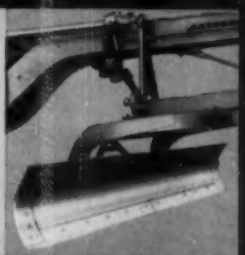
PRECO AUTOMATIC BLADE CONTROL Optional. Exclusive for Caterpillar Graders, improves performance on a wide range of applications. Operator selects desired slope on dial. Now transistorized for freedom from maintenance and adjustment, the unit automatically maintains blade slope within ½ inch in 10 feet.

MECHANICAL BLADE CONTROLS Standard. Exclusive, new Caterpillar mechanical blade controls ease engagement, provide precise blade adjustment and reduce kickback. "Anti-creep" lock makes blade stay put under load. Another plus: Operator, while seated, has unobstructed view of job.

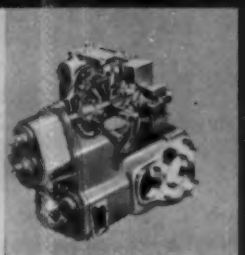


NEW DRY-TYPE AIR CLEANER Most efficient air cleaner ever developed. Removes 99.8% of all dirt from intake air during every service hour. Can be serviced in five minutes. Cuts maintenance time (by as much as 70%) and substantially reduces costs. Extends engine life.

AMPLE THROAT CLEARANCE New design on the No. 14 and No. 12 permits increased clearance between moldboard and circle for maximum loads. Extra strength is built into frame, drawbar and circle to match engine power, absorb the punishment of rough work and assure accurate blading.



OIL CLUTCH Both the No. 14 and No. 12 are equipped with the most advanced clutch design in the industry—proved by millions of hours of use. Provides up to 2,000 hours' service without adjustment, the equivalent of about 12 months of "adjustment free" operation. Virtually eliminates down time for clutch repair.



The New 30-R

has what it takes—and is ready to prove it

Check the specs . . . check the performance . . . you'll find the new Bucyrus-Erie 30-R offers the same outstanding stamina, speed, and ease of operation that make the 40-R and 50-R the most popular blast hole drills in their classes — *by far.*

THE ADVANTAGES ARE ALL THERE — IN A NEW ECONOMY SIZE

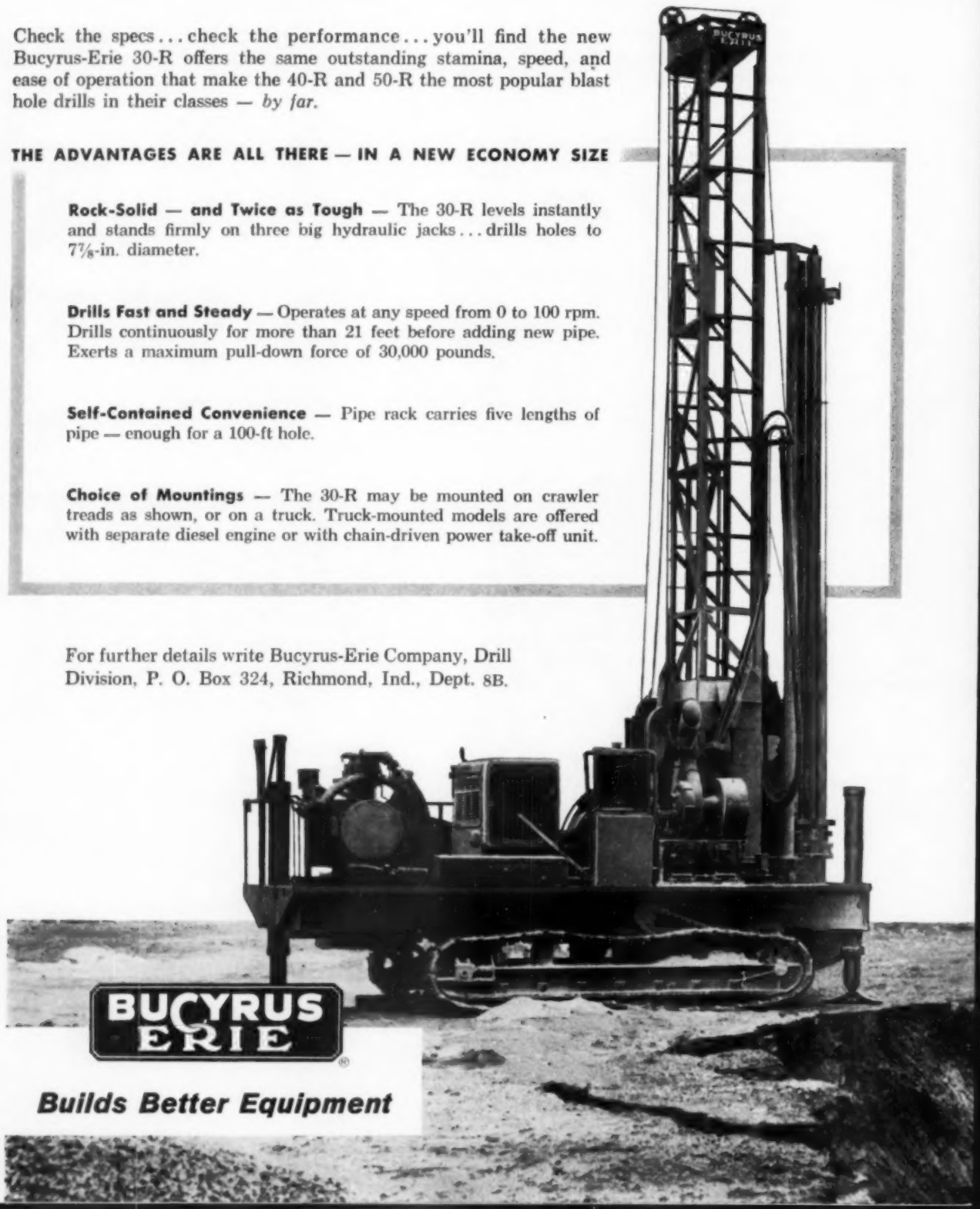
Rock-Solid — and Twice as Tough — The 30-R levels instantly and stands firmly on three big hydraulic jacks . . . drills holes to 7⅞-in. diameter.

Drills Fast and Steady — Operates at any speed from 0 to 100 rpm. Drills continuously for more than 21 feet before adding new pipe. Exerts a maximum pull-down force of 30,000 pounds.

Self-Contained Convenience — Pipe rack carries five lengths of pipe — enough for a 100-ft hole.

Choice of Mountings — The 30-R may be mounted on crawler treads as shown, or on a truck. Truck-mounted models are offered with separate diesel engine or with chain-driven power take-off unit.

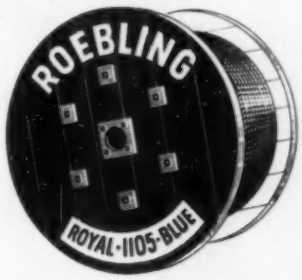
For further details write Bucyrus-Erie Company, Drill Division, P. O. Box 324, Richmond, Ind., Dept. 8B.



BUCYRUS ERIE®

Builds Better Equipment

When you're talking about a $162,000 dipper shovel, you've got to talk about the best rope for it



Talking about or working with, the same thing applies. Anything below Royal Blue's performance level is simply unrealistic. Like looking for a cut-price brain surgeon.

Even at $162,000, the cost of wire rope is important. That's why so-so ropes can cost you more in the long run, because so-so ropes are *short run*. Royal Blue, on the other hand, is built by America's oldest manufacturer of wire rope to last, to do the job without a whimper. Here's why.

Royal Blue is made from the toughest rope wire ever made—Type 1105—extra high-strength improved plow steel. This pedigree gives to the rope qualities that you can't find in any other rope: exceptional resistance to shock, abrasion, fatigue and impact. Add to these a flexibility that age cannot wither nor hustling fade and you've got a collection of characteristics that make Royal Blue the strongest rope you've ever used.

A $162,000 Dipper Shovel deserves the best and your Roebling Distributor has it . . . Royal Blue. For information, write to Roebling's Wire Rope Division, Trenton 2, N. J.

ROEBLING

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John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

YOU ARE INVITED TO
TD-25 OPEN
NOVEMBER 30-DECEMBER 5
INTERNATIONAL

HOUSE, U.S.A.

INTERNATIONAL HARVESTER COMPANY
180 NORTH MICHIGAN AVENUE • CHICAGO 1, ILLINOIS

An open invitation to profit-conscious contractors

At Open House, U.S.A., you won't be viewing "just another big tractor." Not on your life!

This is the big, new International TD-25's "coming out party." And the "25" is coming out "loaded for bear!"

At Open House, U.S.A., you'll preview a king-sized crawler that has more proven, high-output exclusive features than anything else on tracks...The new TD-25 is:

--the only king-sized crawler powered by the new 230-hp, 6-cylinder, direct-start DT-817 diesel--loaded with capacity-adding, life-prolonging features no other engine has!

--the only king-sized crawler with world-proved Planet Power steering, that gives you fingertip power-steering and Hi-Lo, on-the-go power-shifting. Full-time "live" power on both tracks adds payload capacity as no other crawler can!

--the only king-sized crawler with International-developed double-box-beam track frames, the industry's strongest; the only one carried on Dura Rollers--the rollers you can power-lubricate without affecting seal life or efficiency --the ones that make 1,000-hr lube checks practical!

--the only king-sized crawler with so many far-ahead features it can outearn competitive rigs up to 50%, on an amazing variety of tough jobs!

Watch for the word on when and where your Distributor will hold TD-25 Open House, U.S.A. And be there, for sure. Be one of the first to size up the profit-making advantages of the big, new International TD-25.

More productive power to you!

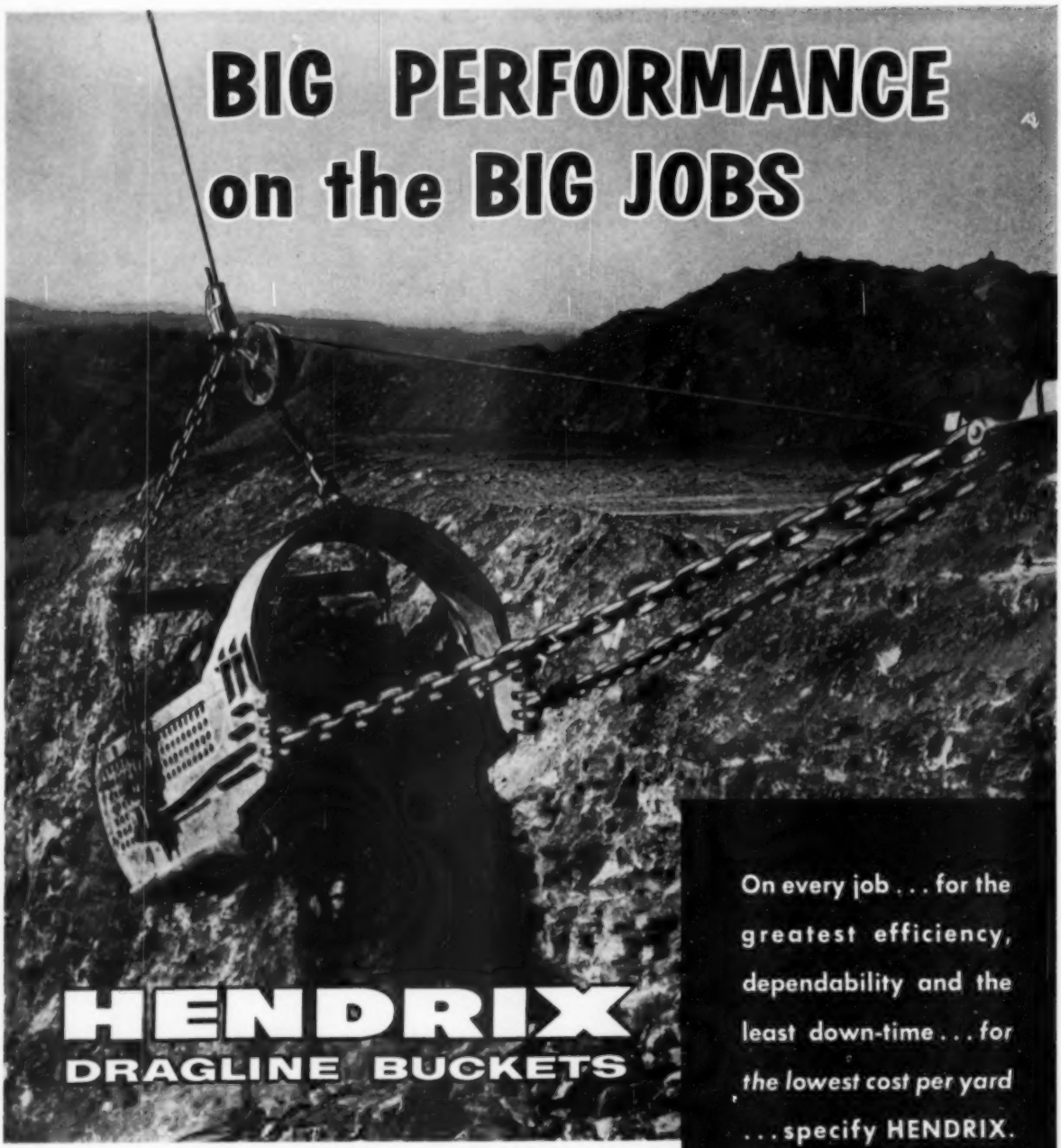
International Harvester Company

International® *Construction Equipment*

International Harvester Co., 180 North Michigan Ave., Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

BIG PERFORMANCE on the BIG JOBS



HENDRIX
DRAGLINE BUCKETS

On every job . . . for the greatest efficiency, dependability and the least down-time . . . *for the lowest cost per yard* . . . specify HENDRIX.

Hendrix *Lightweight* DRAGLINE BUCKETS

"A Type for Every Digging Purpose"...

¼ to 40 Cubic Yards
Perforated or Solid

HENDRIX MANUFACTURING COMPANY, Inc.
MANSFIELD, LOUISIANA

MORE BUCYRUS-ERIE SHOVELS WORK IN ROCK THAN ANY OTHER MAKE!

. . . your proof of performance from owners!

Bucyrus-Erie grew up in rock, on the Panama Canal, on the Mesabi Range, and on scores of major construction projects which have changed the shape of the earth. Throughout this history, Bucyrus-Erie has continually met the demands of bigger and tougher jobs!

Today's Bucyrus-Erie heavy-duty shovels offer modern front-end design to give you plenty of strength, reduce deadweight, let you move big yardages with minimum effort. Bucyrus-Erie improved Ward Leonard electric control gives you fast acceleration and deceleration with extra torque when it's needed.

Every Bucyrus-Erie is designed with a thorough knowledge of the jobs you have to do and conditions you face!

Write today for complete information about the Bucyrus-Erie excavator you'll need for the big jobs you're bidding right now. There's one to handle your job whatever the size. 183150

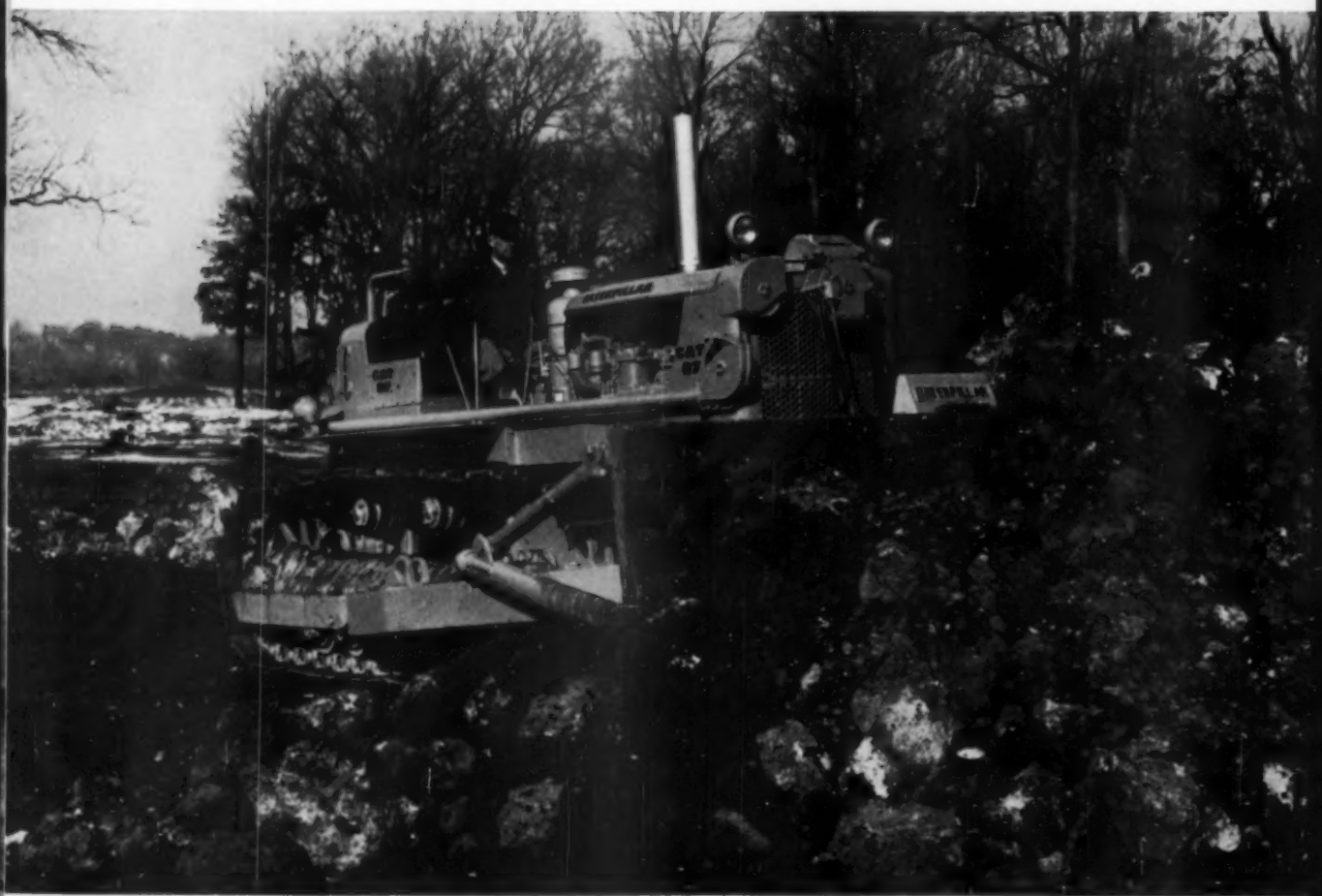
A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

CATERPILLAR'S
PROJECT
PAYDIRT

PROJECT PAYDIRT pays off again...*

NEW CAT D7 SERIES D



***PROJECT PAYDIRT:** Caterpillar's multimillion-dollar research and development program to meet the continuous challenge of the greatest construction era in history with the most productive earthmoving machines ever developed.

TRACTOR

THE PAYOFF FOR YOU: MORE PRODUCTION AT LOWER OPERATING COST THAN EVER BEFORE!

By any comparison the *new* Cat D7 Series D Tractor is champ in its class. It packs 140 horsepower . . . matched with 80% more lugging ability than the previous model for greater production. And it delivers this production with lower operating and maintenance costs. The payoff is increased money-making performance *on your job*—performance that no other tractor in its power range can match!

Major improvements, developed by Caterpillar's Project Paydirt, account for the increased capacity of the new D7. These improvements affect the engine, power train and undercarriage. They're explained in detail on the right.

Along with the new features, the best of the time-tested features of the Series C model have been retained. One of many examples: the exclusive Caterpillar oil clutch, which delivers up to 2,000 hours —one whole season—without adjustment!

For complete facts about the leader in this class, see your Caterpillar Dealer. He's ready to give you the whole story about the new D7 Series D, as well as other achievements of Project Paydirt. He'll be glad to demonstrate, too, for this D7 really shines—in action. Say when and where—he'll be there!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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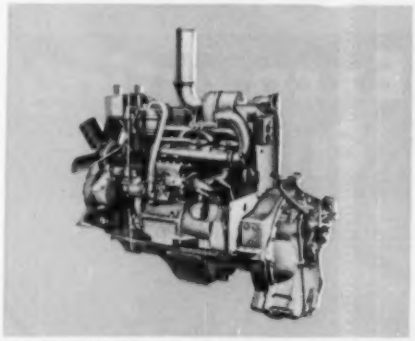
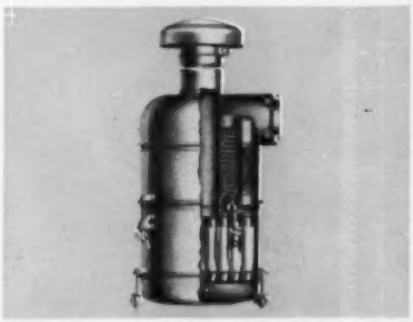
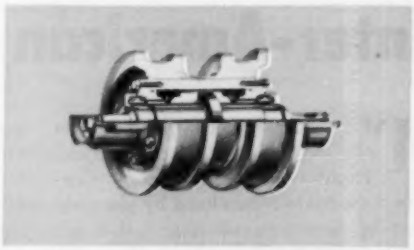
BORN OF RESEARCH
PROVED IN THE FIELD



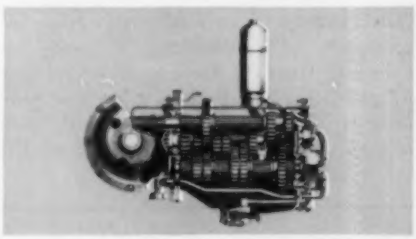
NEW TURBOCHARGED ENGINE. 140 flywheel horsepower . . . 112 drawbar horsepower make the new D7 even more productive. In-seat starting is available as an attachment. And in addition to the 9% horsepower increase, the new Turbocharged Cat Engine offers 80% more tractor lugging ability. The payoff: greater capacity to lug against big loads without stalling—for higher production, greater operating economy.



NEW DRY-TYPE AIR CLEANER. Pioneered by Caterpillar, this new dry-type air cleaner uses cyclone tubes and cellulose filter element to remove at least 99.8% of all dirt and dust from engine intake air—during every operating hour, even under the most severe operating conditions. Filter element can be cleaned and re-used. Cleaner can be serviced in 5 minutes. The payoff: longer engine life, greater economy, less maintenance.

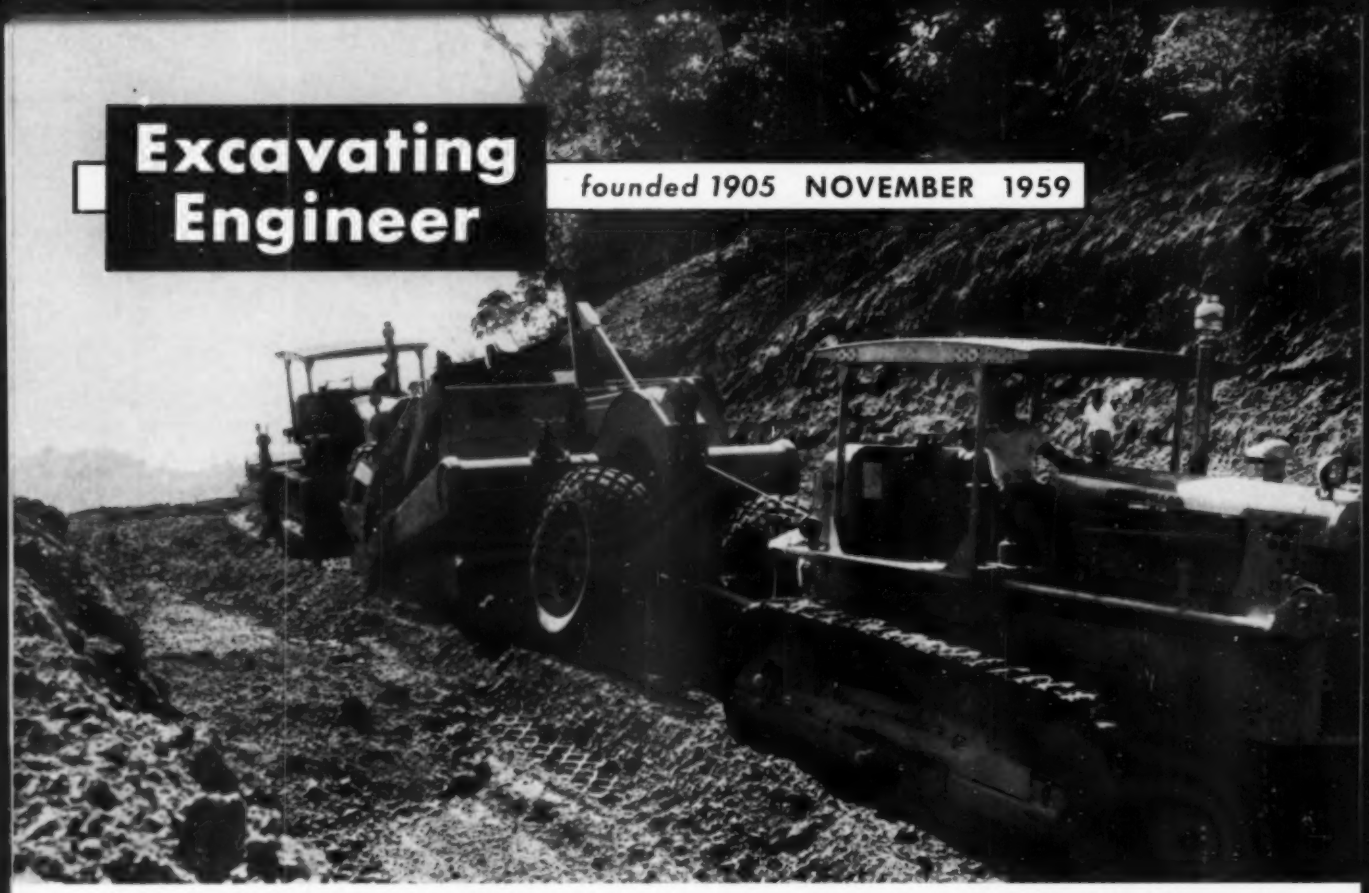


SERVICE-FREE TRACK ROLLERS. New lifetime lubricated track rollers, carrier rollers and idlers on the undercarriage are protected by exclusive Caterpillar floating-ring seals. They need no lubrication until rebuilding, eliminate on-the-job roller lubrication. In addition, track roller life is increased by improved load-carrying design. The payoff: greater economy, longer life, less maintenance.



PRESSURE-LUBRICATED TRANSMISSION. Transmission, bevel gear and pinion are now pressure lubricated with full-flow filtered oil, another development of Caterpillar's research program Project Paydirt. And new power train components, provided to transmit greater horsepower, feature a major increase in strength in the final drive gears. The payoff: longer lived gears and bearings for trouble-free operation.

Excavating Engineer
founded 1905 NOVEMBER 1959



Earth cut is made through a region of dense vegetation by Caterpillar scraper drawn by one D8 tractor and pushed by another.

Last Major Link in the Inter-American Highway

THE last remaining major gap in the long, rugged Inter-American Highway threading through Central America will be closed by the early part of next year when several rough road projects now going on in the small, undeveloped country of Costa Rica will be completed. Some 280 miles of modern two-lane roadway are being built in difficult, impassable terrain where access is a big problem.

The Inter-American Highway is approximately 3,179 miles long. It runs all the way from the Rio Grande River at Laredo, Tex., to Panama City, the Pacific terminus of the Panama Canal. The Inter-American Highway actually is part of the projected Pan American Highways, which will someday reach from Alaska to the broad cattle ranges of Argentina. In Central America, though, the highway is better known by the Inter-American designation because of its function of linking the two continents.

Built Piecemeal

The Inter-American Highway has been slowly going into place on a piecemeal basis since the 1930's. Construction has been somewhat sporadic because many of the Central American republics which the road serves have chronic economic problems. The terrain is among the world's worst for road building, and construction costs are too high for these small countries to finance. Without American help, the highway would still be only a dream.

Since 1934, when Congress authorized an initial fund of $1 million to kick off the project, more than $128 million in United States aid has been appropriated to meet construction costs. The Inter-American aid program is being administered by the U. S. Bureau of Public Roads. Technical assistance and supervision are also supplied by the BPR.

While financing of the road is generally paid for two-thirds by the Bureau of Public Roads and one-third by the Central American republics, in Mexico the entire mileage of the project has been constructed and financed by the Mexican government without any U. S. assistance.

From the United States-Mexico border, the Inter-American route heads south for Mexico City and then swings southeast toward the corridor of small Central American republics between North and South America. Mileages in each country are as follows: Mexico, 1,606 miles; Guatemala, 317; El Salvador, 195; Honduras, 94; Nicaragua, 238; Costa Rica, 413; and Panama, 316.

Current road construction in Costa Rica will open up the last major impassable stretch of the rugged Highway of the Americas. A United States firm is helping build an 89-mile section.

Much of the road mileage has been completed only within the last five years. Progress has been slow and expensive. In many areas the newly completed Inter-American road literally replaces winding cart paths and foot trails.

At the present time, it is not yet possible to travel the entire length of the highway by motor car because of the formidable, impassable gap in Costa Rica, and because of short distances in Guatemala and Panama which are also incomplete.

Except for these sections, the entire Inter-American Highway is either paved or has a gravel or crushed stone surface that is passable in all weather to motor traffic. All of the mileage in Mexico is paved with portland cement concrete or bituminous concrete; in Central America only about half is paved. Some parts of the route are dusty in dry weather; there are also sections where the road is narrow, with steep grades and sharp curves, and where travel by car presents more of a problem than is usual in this country. For much of the route, lodgings and roadside service facilities for tourists are not yet available.

It is not likely that the road will become a popular tourist route overnight. There are far too many rigors for even the hardiest type of traveler to attempt the trip without extensive preparations. However, the road will bring immediate economic benefits to the villages and communities along the way in the form of faster communications and by providing a sorely needed artery for commercial traffic.

Much of Costa Rica is jungle and tropical rain forest. Two steep volcanic mountain chains run through the middle of the country, with rolling table land between them. There are 301 miles of railroads in the country and 1,107 miles of road. The entire country consists of 19,695 square miles, about two-thirds the size of the state of Georgia. Population is about 850,000, for an average of 41 persons per square mile.

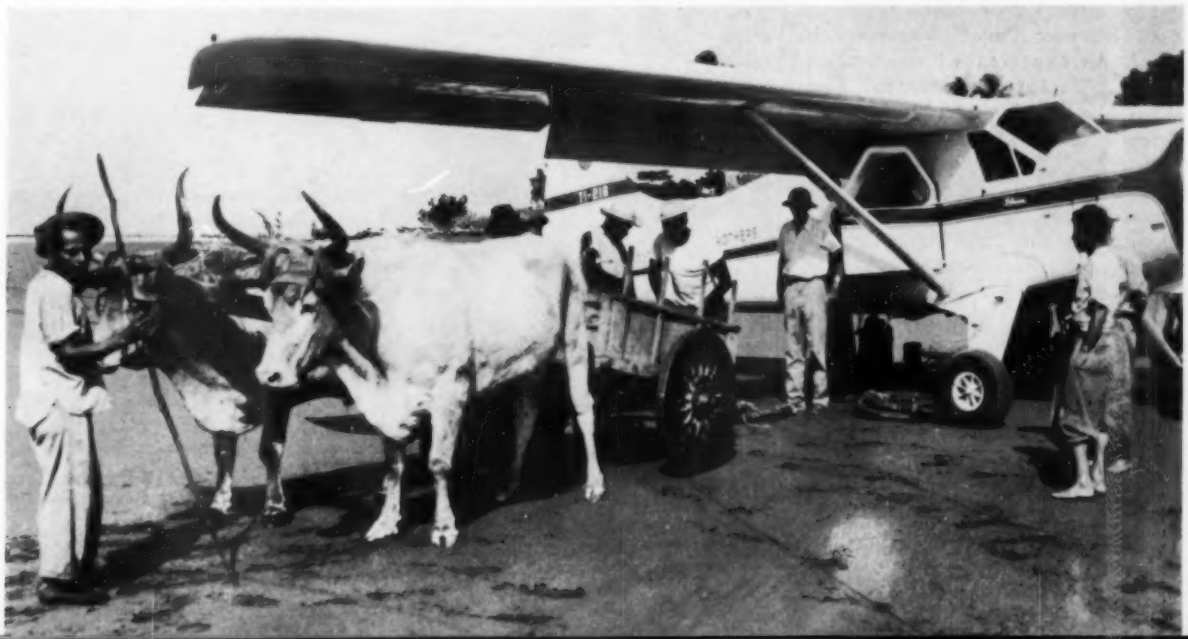
Trails hacked through the rain forest bring men and machines to forward areas of construction. A half-dozen work camps scattered along the road provide housing.

The Inter-American Highway in Costa Rica runs through regions of imposing natural scenery. At Cartago in the mountains a few miles south of the capital city of San Jose, the highway climbs to an altitude of over 10,000 feet. Nearby is the extinct volcano of Irazu, one of the highest peaks in Latin America.

From the volcano's summit at 11,322 feet, tourists will have a matchless panorama of the Central Cordillera mountain range. On a clear day, you can see not only Lake Nicaragua 100 miles away, but also both the Atlantic and Pacific oceans.

The Bureau of Public Roads has

Sandy beach provides a landing strip for this DeHaviland single-engine Beaver. Plane averages 18 landings and takeoffs daily.



Outboard-powered rowboat is an excellent mode of transportation in the dense jungle. Shown here on an inspection trip is M. B. Kite, general manager of Construction Div. of Williams Brothers Co.

Williams Bros. used this landing ship, patterned after the American LCT military craft, to bring in heavy equipment to the Costa Rica job. It carries a 400-ton cargo.

broken up the Costa Rican construction task into four contracts. Two of these contracts, held by a group of Costa Rican firms, are for reconstruction and paving a stretch from San Ramon to the Nicaraguan border—about 147 miles. The remaining two contracts—89.4 miles of road to the Panama border—are being completed by Foster Construction Co., C. A., San Jose, Costa Rica, which is operating in joint venture with a well-known American contracting firm, Williams Brothers Co., Tulsa, Okla. Grant Foster, president of Foster, is general project manager.

Veteran Manager

Field direction of Foster-Williams work is under Project Manager Zeb Ward. An experienced construction veteran, Ward formerly headed road projects in Honduras for J. A. Jones Construction Co. District engineer for the BPR is W. T. Brown.

Directing the project for the government of Costa Rica is Public Works Minister Espiritu Salas.

Some of the background of the Foster-Williams project was related to *Excavating Engineer* by Jim Dittus, project engineer for Williams Brothers, who makes his headquarters at the firm's home office. Dittus is one of several key home office personnel who assist with managerial supervision of foreign jobs by periodic travel overseas.

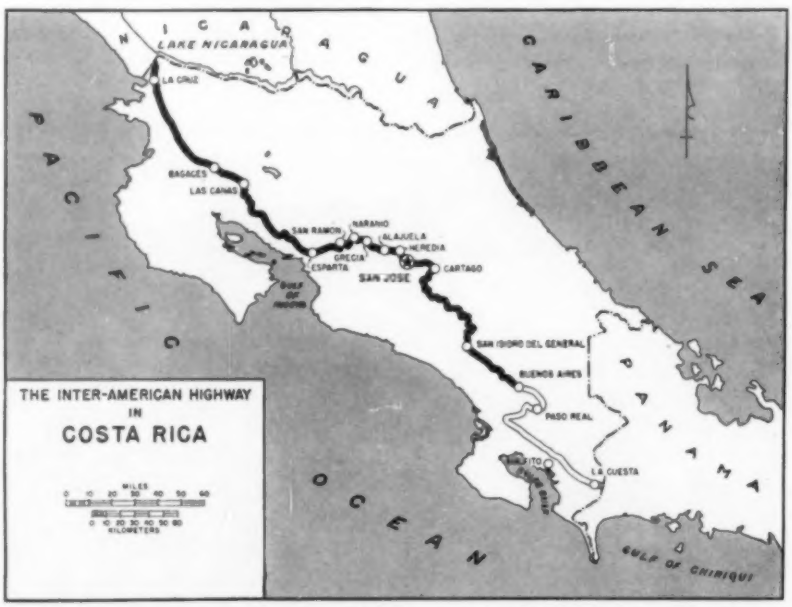
The Foster-Williams project begins in rough terrain near the town of Buenos Aires, about 80 miles south of San Jose. Other small towns along the alignment include Volcan, Palmar, Paso Real, Golfito and La Cuesta, the latter near the Panama border.

The project is road construction of a type that only an experienced overseas contractor can successfully handle. It has difficulties galore—access, logistics, weather plus the very nature of the country. There's heavy clearing, lots of solid rock excavation and innumerable stream crossings and channel changes where creeks must be diverted from the roadway.

Contract quantities lean very heavily toward the excavation side with comparatively little borrow. Unclassified roadway excavation is estimated at 10,-100,000 cubic yards while only about 500,000 cubic yards of borrow are required. Close to 30% of the excavation has been rock, mostly limestone and shale formations.

Other quantities are select borrow base course, 520,000 cubic yards; structural excavation, 82,000 cubic yards; channel change excavation, 145,000 cubic yards; and overhaul, 3,500,000 station yards. The clearing item is 887 acres.

The contractor is doing the following work: grading, drainage, furnishing and placing of select borrow material, and furnishing in stockpiles the crushed stone base. Work began on the project



Foster-Williams section of the Inter-American Highway is in southernmost Costa Rica. Project is 89.4 miles long and extends from Buenos Aires to Panama border.

Heavy rock cuts are commonplace on the Inter-American Highway. This 2-yd. shovel casts blasted rock from a lofty road cut.

during 1956 shortly after award of contracts.

With forecasted final quantities, the value of the project will run near $15 million. Total cost of the road was originally estimated at $12.2 million; the main reason for the difference being the increase in the amount of slides, which now total over 1,000,000 cubic yards, and overruns in select borrow base course and roadway excavation, all resulting from unforeseen soil conditions.

To bring heavy construction equipment from the United States, Foster-Williams constructed especially for the project a large landing craft powered by 400-hp Cat diesel engines and capable of holding 400 tons of deck cargo. Named *La Inter-Americana*, the ship was closely patterned after the well-known American LCT landing craft, but was slightly larger in capacity. The ship was used for about a year and a half and made 11 round-trips from the States to Costa Rica before it was recently sold. It carried 1½-yd. shovels, large scrapers and dozers and other heavy construction equipment, as well as spare parts and some permanent materials. A total of nearly $4 million in new machinery was purchased for the job.

Sailing from Miami, the ship passed through the Panama Canal and then traveled up the Pacific Coast to the Terraba River and the town of Puerto Cortes, 15 miles from the sea. Maximum depth of the river was 8 feet at high tide.

All of the heavy-duty equipment such as shovels, tractors and scrapers was unloaded at Puerto Cortes. An access road 12 miles long from Puerto Cortes to the closest point on the job was built. As pioneer roads were constructed to other points and sub-camps were established, the large equipment moved out on the job under its own power. Smaller equipment, materials and supplies were sledded in with tractors or hauled in by trucks.

Diesel fuel, gasoline and lubricants are furnished by Esso from tanks in Puntarenas, a Pacific port 150 miles up the coast from the mouth of the Terraba River. The fuel is picked up there and transported to the job by a 300-ton barge and 65-ft. seagoing tug owned by Foster-Williams. The trip takes about 30 hours. Cement and other materials brought into Costa Rica from the States and Puerto Rico by commercial shipping are transhipped to the job by this same combination.

To cross the Terraba River, which

This Cletrac crawler used to haul explosives, supplies and personnel is affectionately known as the "Lagartos Express." Lagartos is the site of a small, remote work camp.

Powder crew mixes ammonium nitrate with fuel oil to improve efficiency.

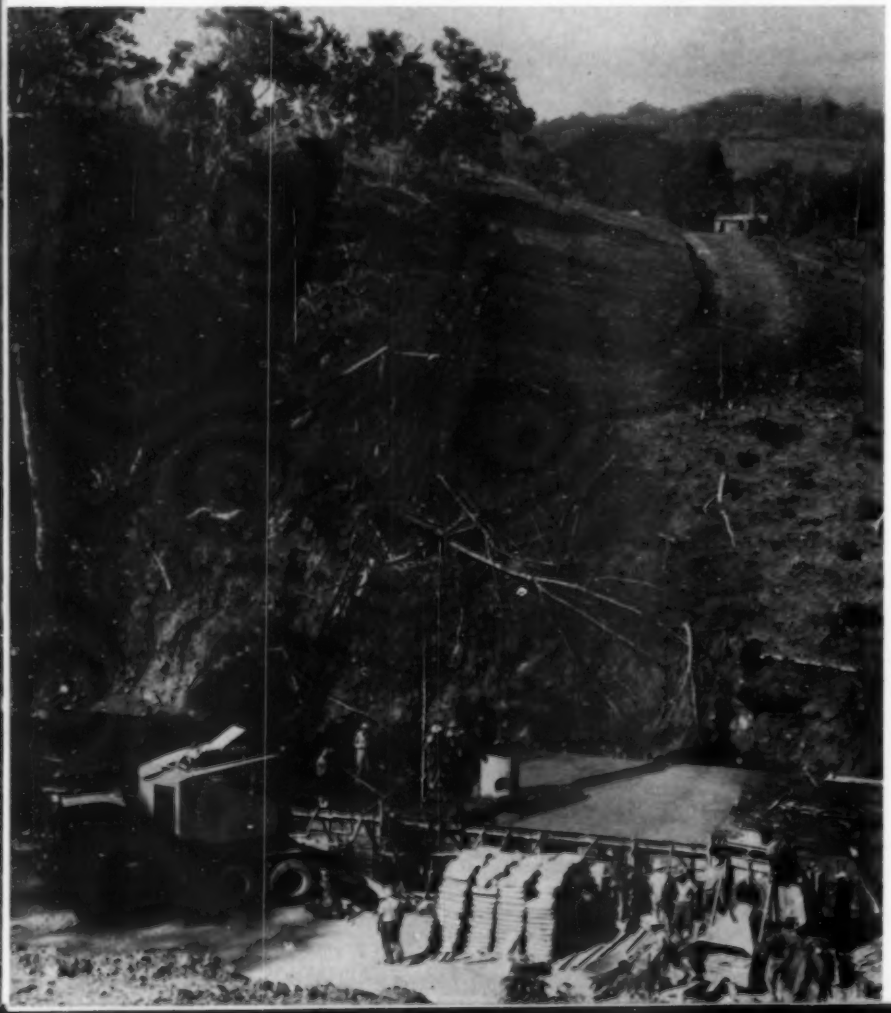
cuts through the project, Foster-Williams uses an amphibious DUKW and a LCM landing craft. These small vessels carry personnel, materials and light equipment. All heavy equipment is moved across by barge during the rainy season and is walked across during the dry season.

A fleet of planes is also a necessity on a remote job like the Inter-American Highway. Foster-Williams uses a De Haviland Beaver and a Navion to fly personnel, camp supplies, equipment parts, fuel and such construction items as corrugated metal drainage pipe into forward camps. Foster Construction Co. also has a twin-engine Lodestar available to the joint venture, and it is used to fly personnel to and from major airport terminals. Five air strips were hacked out of the jungle to accommodate the planes. One of the strips will accommodate C-46 and C-47 type airplanes. The remainder, however, range from 600 to 1,000 feet in length and are used only by light planes.

There will be a total of 29 bridges on the 89-mile long project. Their construction, however, will have to wait appropriation of funds. Only a few major bridges are now going into place.

Largest bridge on the job is the crossing of the wide Rio de Terraba at about 30 miles from the northern start of the job. The bridge is 1,300 feet long with three truss spans and four approach spans supported on concrete piers. It is the only bridge now under contract.

A 25-ton Lorain truck crane pours the roof of a large double 10x10x151-ft. box culvert that carries a creek under the roadway. Portable mixer provides concrete.



Foster-Williams' work actually involves two sections. The northernmost of these two sections consists of 55 miles of roadway from Buenos Aires to a point near Piedras Blancas on the Esquinas River known as the "Ballast Pit." The route of the Inter-American highway in this mountainous northern section generally follows along the Rio de Terraba river which winds tortuously through deep canyons in rugged foothills and mountain ranges. Rock cuts range up to 400 feet deep.

Banana Railroad

The southern section consists of 34 miles of less mountainous road from the Ballast Pit to the Panama border. The road alignment here closely follows the route of the local "banana railroad" of the United Fruit Co., used to move the fruit harvest from vast plantations.

The road varies from 16 to 18 feet wide and has 3-ft. shoulders on each side. Minimum radius of curvature is 384 feet, and the minimum sight distance is 500 feet. Maximum grades will be 4 to 5% for grades not more than 3,800 feet long, and 5% for longer grades. Although original design called for placing crushed stone base course, this item was deleted from both projects. About 400,000 tons of this material are being furnished in stockpile for placing at some future date. At that time an asphalt surfacing will also be applied. To provide an all-weather road without the crushed base course and surfacing, select borrow base course is being placed

throughout the length of the projects, except in rock cuts or on fills constructed of river gravel.

In the Terraba River section where work is now substantially complete, the excavation was primarily a shovel and dozer operation; south of the river in the jungle country, scrapers and draglines took over the brunt of the work.

Biggest cuts of the job were along the Terraba River, where the roadway was cut into sheer walls of solid rock. Because of the ¼ on 1 side slopes, slides were extensive in this area, accounting for over 90% of the 1,000,000 cubic yards previously mentioned. Not only did these slides disrupt traffic, they also plugged drainage ditches along the road, playing havoc with the roadway base as water flowed across the road bed and softened it up. These slides vary in size from small trickles of only a few yards to the avalanche-type where thousands of tons of rock and dirt pour down across the roadway.

Much of the excavation in the canyon country was such that dozers could push big chunks of blasted rock over the outer side of the roadway into the river below. In other areas, rock dug by the shovel fleet was hauled by Athey rock dumps short distances to dumping points at fills.

In the shovel fleet were two 3½-yd. Lima 1201 shovels, dating back to 1940, which were purchased by the contractor from the Bureau of Public Roads. They had been completely modernized and fitted with air controls. There also were a 2-yd. Bucyrus-Erie 51-B; and two 1½-yd. 38-B's. The dozer lineup consisted of 13 D6's, 18 D8's and 7 D9's.

During excavation of cuts, one-way traffic had to be maintained past the digging banks in order to keep supplies rolling to forward areas.

Biggest cut on the job was known as the Disciplina cut where, in a 3,000-ft. long section, there were 700,000 yards of excavation from a cut 240 feet high and with ¼ on 1 side slope.

Rock excavation north of the Terraba River required extensive drilling operations. As of June 1958, about 2,400-000 lineal feet of 3½-in. diameter blast holes were drilled by the crews. All of the drilling was done through use of 12 Air-Tracs and six 900-cfm compressors—all Gardner-Denver.

Blasting Ease

Ammonium nitrate was used "quite successfully" on the northern end of the job in spite of high humidity, according to Jim Dittus. The rainfall is much less in the northern region than in the south. Crews had to be watchful of the weather because of frequent flash rain storms and the danger of losing holes because of flooding. Ammonium nitrate worked out well because of the cheap labor factor and ease of handling. The free-flowing pellets were mixed with fuel oil by crews before being poured into the 3½-in. holes. For detonation, a 1¼ x 8-in. stick of 40% dynamite—both Atlas and Hercules brands were used—was spaced at 12 to 18-in. intervals on 50-grain Primacord running the length of the hole. An electric blasting cap was attached to the bottom stick for firing.

Another method used was combining 10 pounds of 40% dynamite with 80 pounds of ammonium nitrate together with 7% (by weight) of diesel fuel. This mixture was detonated with an electric cap and a stick of dynamite at bottom of the hole. About 1,100,000 pounds of ammonium nitrate, 1,400,-000 pounds of 40% dynamite in 1¼ x 8-in. and 3 x 4-in. sticks and 120,000 caps were used on the entire project. Breakage required 0.9 pound of explosive per one yard of rock. Largest size shot pulled was about 15 tons of explo-

Major Equipment on Job

2	Bucyrus-Erie 38-B 1½ yd. excavators (shovel and dragline)
1	Bucyrus-Erie 51-B 2-yd. shovel
2	Lima 1201 3½-yd. shovels
2	Lorain L25-A crawler cranes
2	Lorain 25-ton truck cranes
2	Gradalls
18	Caterpillar D8's
7	D9's
13	D6's
2	977 Traxcavators
3	955 Traxcavators
4	La Plante Choate tractor-scrapers
4	Caterpillar DW-21 tractor-scrapers
6	Caterpillar tractor-drawn scrapers
6	Caterpillar DW-21 tractors with Athey PR-21 rock wagons
2	15-ton rollers
2	Wobble-wheel rollers
4	Sheepsfoot rollers
5	Caterpillar No. 12 graders
40	Ford trucks
28	Pickups, all with radio communication equipment
12	Gardner-Denver Air-Trac drills
6	Gardner-Denver 900-cfm rotary compressors
4	Gardner-Denver 210-cfm rotary compressors
1	Cedarapids primary and secondary rock crushers, 150-tph
1	Lipmann primary and secondary rock crushers, 75-tph
2	Concrete mixers, 16's
5	Concrete mixers, 11's
1	De Haviland Beaver
1	150-hp tug
1	50-hp tug
1	Fuel barge
1	300-ton deck barge
1	LCM

(Left) River-bed cobbles are processed through this crushing plant to make aggregates for concrete and road courses. (Right) A concrete box-culvert will allow runoff water to flow under the roadway. Heavy rainfall requires big drainage structures.

Reflecting an atmosphere of friendly cooperation, this group includes Nick Soto (left), inspector for the U. S. Bureau of Public Roads; Ben Wallace, master mechanic for Foster-Williams; Zeb Ward, project manager; and an unidentified Costa Rican.

(Above) A 1½-yd. shovel loads rock from cut into Athey PR-21 rock-dumper. (Below) The 30-ton load is end-dumped a short distance away. Six Athey PR-21's are used.

sives; average shots consisted of about five tons.

Rock excavation consisted mostly of limestone and shale. The material was not especially abrasive, making possible good drilling footage per hour and long drill bit life. The chief drilling obstacle was the problem of fractured rock falling down the drill hole and binding the bits.

An interesting feature of the southern end of the project is the change in the character of excavation compared with the rocky northern route. Here the roadway cuts through impenetrable jungle with underlying typical swampy material and plenty of wet mud. The jungle is dense with tangled vines, matted thickets and many large trees which have to be cleared from the right-of-way.

1960 Completion

Most of the excavation in the southern section was completed last May; however, because the work ended during the middle of the rainy season (which extends from April through December), crews will have to finish up after the first of the year.

February is Costa Rica's only dry month; as the rains become progressively heavier, work is reduced in scope. Average temperature during the rainy season is about 85°, but the humidity at elevations of 100 to 500 feet above sea level is terrific. During the dry season, temperatures of 95 to 100° are a daily occurrence.

As much as 4 inches of rain have fallen in one hour, coming down in huge, splattering drops. Access is often impossible during the rainy season as equipment becomes bogged down in mud. Crews had to construct temporary culverts to prevent roads from washing out; timber bridges were built; and in many places, trucks crossed shallow streams, if low water permitted. Tremendous rains often flooded out the pioneer roads, isolating crews overnight.

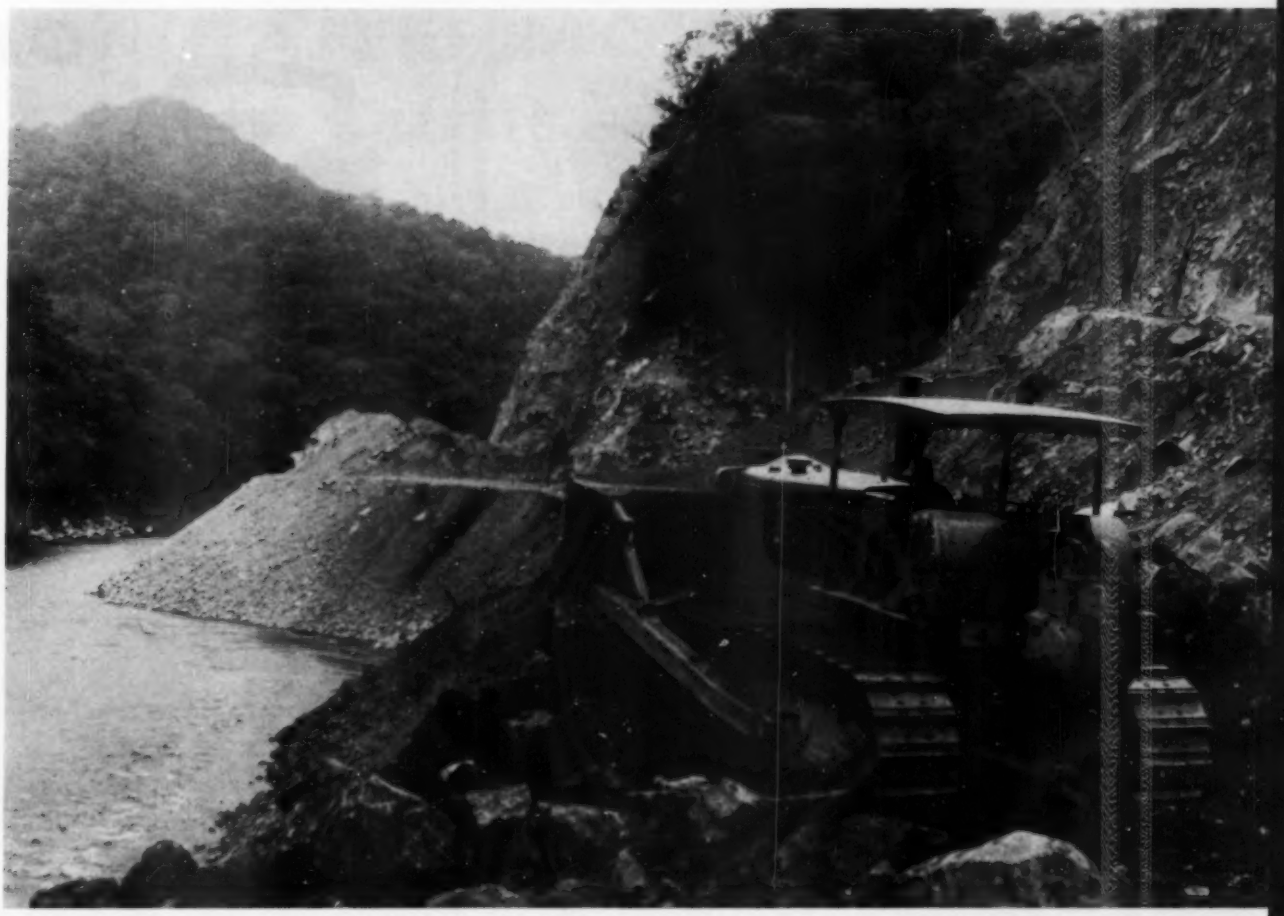
Because of the rains, more drainage structures are required in the Costa Rican route than would be needed on a similar road of equal length in the United States. The average annual rainfall in Costa Rica is about 100 inches most of which falls during the rainy season. However, as much as 300 inches per year have been recorded in some parts of the country. About 50,000 lineal feet (1,500 tons) of corrugated metal pipe from 18 to 150-in. diameter have been placed in 844 sepa-

rate installations. Concrete in box culverts is also a big item. There will be 11,500 yards in this type of structure.

Foster-Williams established a main work camp and three sub-camps. All camps had the modern conveniences of running water and electric lights. At the main camp of Palmar Norte located on the Terraba River near the town of Puerto Cortes, 100-kw and 60-kw generators provided electricity.

Remoteness of the job from any sizeable city has made equipment maintenance even more than normally important. Practically all of the equipment is brand new—it is impractical to try to maintain old equipment from outside sources. Foster-Williams set up extensive repair and service facilities at Palmar Norte camp consisting of corrugated steel shops, storage sheds, and open-sided buildings which served as repair bays. There were facilities for vehicle lubrication; tire service; fuel and grease storage; and general overhaul of heavy equipment. Standardization on equipment by makes and types has simplified the job of maintenance and upkeep to a considerable degree. In drilling equipment, for example, Gardner-Denver drills and compressors are standard. Tractors are exclusively Caterpillar, as is the bulk of the scraper equipment.

Hours on the job are long. The work day begins at 5 a.m. and lasts until 4:30 p.m., seven days a week. Costa Ricans are off four days a month on a short-leave type of arrangement locally known as the "salida." The only trouble with the salida practice is that key personnel always seem to be gone when mechanical and excavation problems occur. The project area, except for a few small farmers and scattered villages, is uninhabited and without roads, offering little after-hours amusement for construction workers.



High tree-covered foothills bordering the Rio de Terraba make an eye-filling sight as a D9 dozes over the bank rock from a cut.

Workers Trained

Costa Rican labor is used extensively in clearing, grubbing, cut-and-fill excavation and concrete work. Costa Rican instrument men, chainmen, rodmen and machete men are employed with the engineering parties.

Some of the operators for the heavy power equipment have been brought from the United States because of the need for men skilled in the use of the big equipment. Costa Rican workmen are given every opportunity for employment in all positions for which they may be qualified. They have proved themselves very capable.

About 1,000 Costa Ricans were on the payroll early this spring; a maximum of 1,200 were employed during peak activity. There were about 35 Americans on the job acting in engineering and supervisory capacities.

Besides Project Manager Zeb Ward, main officials include Peter Vischansky, project engineer; Ben Wallace, master mechanic; and Buck Jones, general superintendent. Harry Werkheiser is in charge of the main office in San Jose

Continued on page 64

MODEL CW-220
20.0 cu. yds. STRUCK
27.0 cu. yds. HEAPED
INTERCHANGEABLE WITH MODEL CWD-221 REAR DUMP UNIT

YARDS

ON

MODEL CW-215
15.0 cu. yds. STRUCK
21.0 cu. yds. HEAPED
INTERCHANGEABLE WITH MODEL CWD-214 REAR DUMP UNIT

MODEL CW-27
7.0 cu. yds. STRUCK
10.0 cu. yds. HEAPED

MODEL CW-226
26.0 cu. yds. STRUCK
36.0 cu. yds. HEAPED

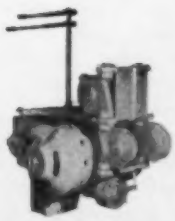
MODEL CW-320
20.0 cu. yds. STRUCK
27.0 cu. yds. HEAPED
INTERCHANGEABLE WITH MODEL CWD-221 REAR DUMP UNIT

MODEL CWD-221
21.0 cu. yds. STRUCK
31.0 cu. yds. HEAPED
35-TON LOAD CAPACITY
INTERCHANGEABLE WITH MODELS CW-220

INTERCHANGEABLE WITH MODEL CW-320 SCRAPER UNIT

MODEL CWD-321
21.0 cu. yds. STRUCK
31.0 cu. yds. HEAPED
35-TON LOAD CAPACITY

MODEL CWT-20
20.0 cu. yds. STRUCK
27.0 cu. yds. HEAPED



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for standard tractors in every horsepower range

AHEAD

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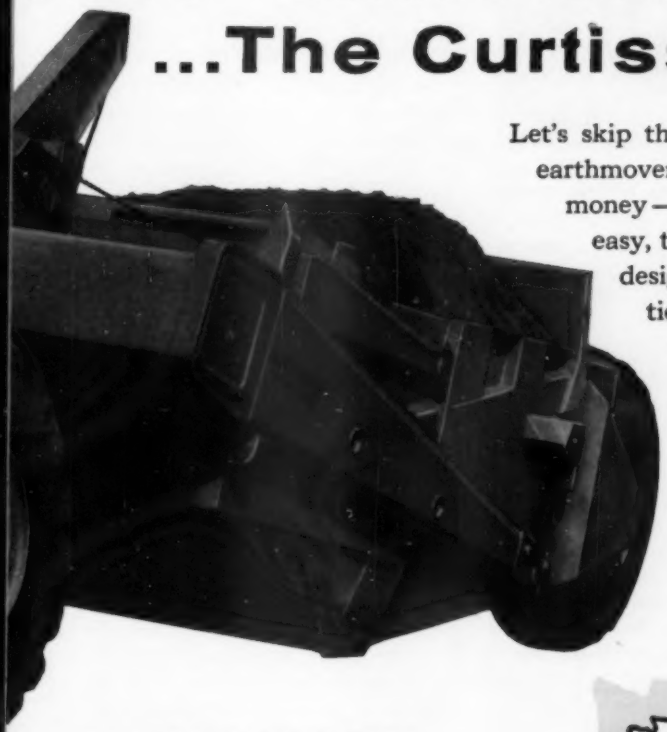

Let's skip the details and get down to basic facts about earthmovers. If you move more dirt, you make more money — it's as simple as that . . . and just about as easy, too, with the modern Curtiss-Wright line. C-W design features for high performance, easy operation and low maintenance put you yards ahead in production — dollars ahead in profit on any earthmoving job. Call your Curtiss-Wright distributor for complete information and specs on the machine performance matched to your job requirements.

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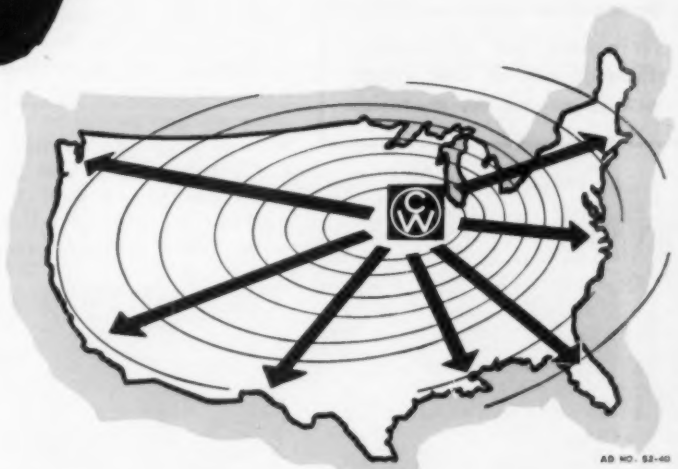


AD NO. 52-40

SOUTH BEND DIVISION, CURTISS-WRIGHT CORPORATION • SOUTH BEND, INDIANA

SOUTH BEND DIVISION
CURTISS-WRIGHT CORPORATION
SOUTH BEND, INDIANA

On shore 100-ft. long strings of 5-in. x 25-lb. sticks of 60% Gelatin Extra are prepared for loading into a small barge. Sticks will be strung along bottom of bay.

Blast Underwater Rock Without Drilling

Stringing out dynamite sticks on top of thin, tough rock layer breaks material.

by William F. Hallstead

THE expedient of simply dropping large amounts of explosive on top of a tough underwater limestone layer proved the inexpensive answer to a problem that had brought dredging operations along Chesapeake Bay to a stop recently.

The place: Patuxent naval air station seaplane basin.

The problem: How to get through a limestone formation under 11 to 13 feet of water. The 14-yd. dredge dipper couldn't break it up, and speed was essential to meet the work schedule.

The solution: A 500-lb. test shot by Burnbrae, Inc., a Maryland blasting company, proved that heavy charges simply laid on the 2-ft. thick layer without any drilling would do the job.

Area to be blasted was about 200 x 400 feet. The blasting agent was Hercules 60% Gelatin Extra in 5-in. x 25-lb. sticks. These large sticks were drilled lengthwise with a sharp steel rod and strung at 6½-ft. intervals on 100-ft. lengths of reinforced Primacord. Two of these strings of charges were loaded per trip on a small outboard-powered barge. When they were placed over the side in alignment with shore ranging markers, they were connected together end-to-end to form a 200-ft. long line of charges. Each 200-ft. long shot—about 750 pounds of high velocity gelatin—was laid parallel to and 10 feet from the preceding placement.

The barge men secured one end of each placement to a wood float as they withdrew for their next load. As the barge moved shoreward, the blasting foreman in an outboard attached a double fuse to the 200-ft. charge. This fuse consisted of two No. 6 blasting caps, each crimped to a 10-ft. length of 120-second-per-yard safety fuse. Taped to this double fuse was a 2-ft. length of Primacord which was simply tied to the floating end of the underwater charge. When the connection was made, the blasting foreman touched off the twin lengths of safety fuse and had a more than ample five minutes to get to shore. In the event that the motorboat's outboard failed, a set of oars was carried as a safety measure.

Completely Safe

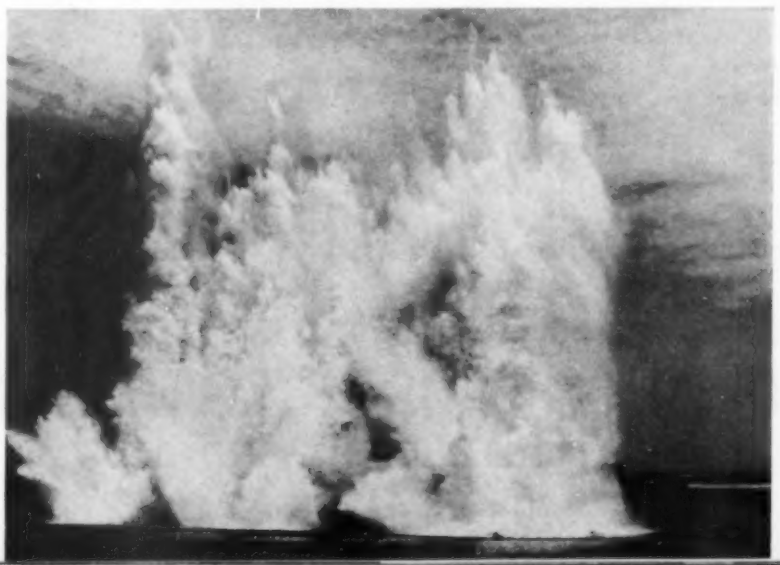
The explosions—30 of the 5-in. sticks were detonated instantaneously—were heard more than three miles away but the water cover held ground shock down. There was no reported damage to nearby installations, and surprisingly few fish were killed.

Immediately after each shot, the barge moved back into position to place the next 200-ft. string of explosives. With two men handling the firing, three men placing charges, and five men on shore preparing loads, the blasting company was able to place and fire 750 pounds every 12 minutes at peak production.

Five days were required for the entire blasting operation. Fracturing was complete, and the water cover prevented any fly whatsoever.

Though this particular job does not present conclusive evidence of what maximum rock formation thickness can be broken in this manner without drilling, it was an excellent example of the imaginative use of explosives doing what conventional methods could not.

Sub-contractor for blasting was Burnbrae, Inc., Baltimore, Md. Prime contractor was Norfolk Dredging Co., Norfolk, Va.



A 750-lb. underwater blast at its height is impressive. Note absence of rock fly which permitted taking a closeup shot.

Workmen direct high-pressure jets of water on phosphate matrix mined by 7-W dragline, converting the material into a slurry.

Coronet Wrests Phosphate from Swamps

by J. N. Becker

Florida firm which began operations 50 years ago with steam shovels now uses three draglines to move 7 million yards of material annually. Swamp clearing and draining is major problem.

PICTURESQUE cypress swamps conceal a treasure-trove of valuable mineral in the rich phosphate fields of central Florida. Draining and removing the swamps to make the phosphate accessible is the first big step in the operations of Coronet Phosphate Co., now starting its second half-century of phosphate mining.

Coronet, a division of the Smith-Douglass Co., Inc., of Norfolk, Va., is presently mining a 4,500-acre tract at Tenoroc, Fla., two miles northeast of Lakeland. Not all of the acreage is mineable. Drainage of the numerous swamps must be planned and started months, sometimes years, ahead of actual mining. High water tables and flat terrain complicate the task.

New mining areas are first opened up by small draglines which cut drainage canals, then dig a network of ditches leading to the canals. After an area is well drained, bulldozers are dispatched to clear away trees and dense undergrowth. These dozers are Allis-Chalmers HD-20's equipped with hydraulic

Draining swamps which cover phosphate deposits is Coronet's first big step. Cutting a drainage ditch is this Northwest model 25 dragline with ¾-yd. Page bucket.

blades, cargo winches and special booms of Coronet's own design. The vegetation is heaped into piles for burning or pushed into nearby mined-out cuts.

Mucky overlay must be cleared to provide firm footing for mammoth draglines which dig out the phosphate. Often the muck is only 12 to 18 inches deep, with white sea-sand underneath, and the dozers push it into adjacent mined-out pits. Where muck is too deep for the dozers to handle, the large draglines are assigned the additional task of digging it out to provide their own area. A path must be cleared for a mining cut 200 feet wide, plus an additional 100 feet for pumping equipment and pipelines.

In mining the phosphate ore, known as matrix, Coronet is using two Bucyrus-Erie walking draglines and one B-E rail-mounted dragline. A 9-W machine is equipped with a 160-ft. boom and 10-yd. bucket and is presently digging a distance of 12,900 feet from the processing plant. A 7-W dragline is equipped with a 140-ft. boom and 8½-yd. bucket, and is working 13,000 feet from the processing plant. The rail-mounted model 37S-B is equipped with a 140-ft. boom and 8½-yd. bucket, and its present location is 11,000 feet from the Tenoroc plant.

All three machines operate in the same manner, first removing the overburden and spoiling into adjacent mined-out cuts, and then picking up the matrix and dumping it into an earth-made mining well just in back of the cut line. These mining wells have semi-circular or rectangular dikes four feet high built with dozers or draglines. They confine the matrix as it is dumped from the dragline bucket.

A hole is dug some six to eight feet deep on the far side of this well and a suction pipe from a 16-in. Georgia Iron Works dredge pump is placed in it. Two hydraulic monitors, one on either side of the pump intake, sluice up the matrix, and the resulting slurry is picked up by the dredge pump through a 16-in. diameter pipeline to the Tenoroc processing plant miles away.

Big Pumps

To transport the slurry, four boosters, or lift pumps, are required. The pit pump and the four boosters are all 16-in. Georgia Iron Works pumps and are directly connected to 800-hp General Electric slip-ring variable speed electric motors. Water for the hydraulic or pit guns is supplied through a 14-in. line from a high-head turbine-type water pump delivering 4,000 gpm at 190-psi gun-tip pressure.

Coronet's production of phosphate rock is approximately 650,000 tons per year. To produce this tonnage the three big draglines must move approximately 7 million cubic yards of material annually. The average overburden in the Tenoroc area is 25 feet deep, and the average matrix thickness is 8 feet. The matrix consists of approximately 25 to 30% phosphate rock, with the rest made up of equal parts of sand and clay.

The sand and clay waste material is pumped from the processing plant to large diked areas and confined mined-out cuts. Sand is sometimes used to build or reinforce the dike areas. Slimes are allowed to settle in these areas and the water is skimmed off and re-circulated for make-up supply. Coronet's mining operations run continuously 24 hours a day, five days a week.

A layer of overburden covering the matrix is stripped by this 9-W, which carries a 10-yd. BM bucket on its 160-ft. boom. Material is dumped in the previous cut.

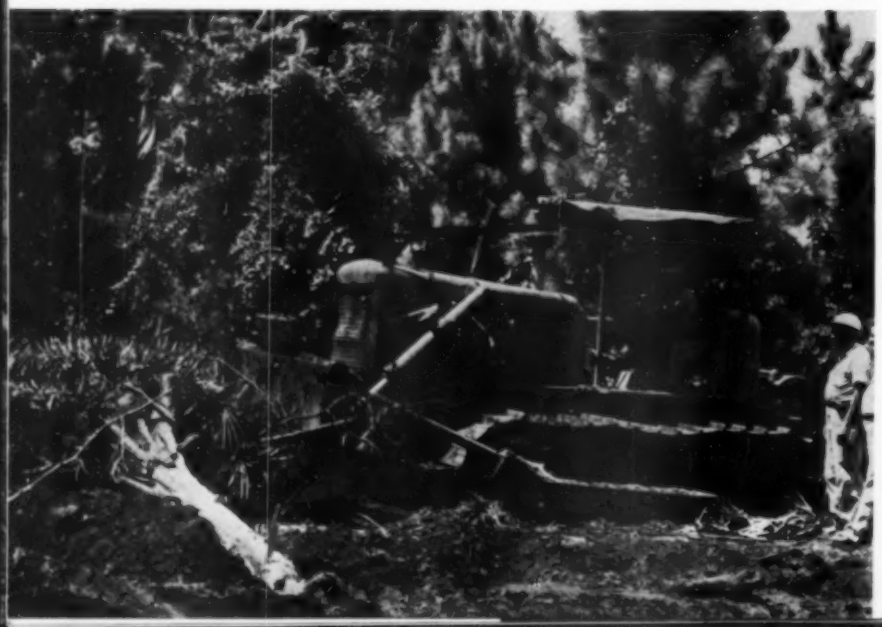
The yardage obtained with the three machines' combined bucket capacity of 27 cubic yards is considered excellent. The material is relatively easy digging, and bucket factors are high due to its texture. In removing the overburden, every advantage is taken to favor the degree of swing. Weights of overburden and matrix vary from 2,600 to 3,400 pounds per cubic yard.

In order to get the maximum recovery, the pit must be kept dry. The water table in this vicinity is often only a couple feet below ground level, and pits are dewatered by placing electrically driven dredge-type pumps in the bottoms. Drainage ditches in the pit bottoms are maintained after the matrix is removed to keep rain and seepage water from being trapped.

The phosphate rock varies in size from 1-in. diameter to 150-mesh. The larger sizes down to 14 mesh are recovered from the matrix in a washing plant by various screening methods. The minus 14 to plus 35 mesh material is recovered by belt flotation. Smaller particles, minus 35 to 150 mesh, are recovered in flotation cells.

Wet phosphate rock is transferred from the processing plant to an open-air

Mine property is covered by thick tropical swamplands. This Allis-Chalmers HD-20 dozer clears a path wide enough to give draglines working room for a 200-ft. cut.



storage by means of belt conveyors and a Robins stacking conveyor. A concrete tunnel under the storage pile transports the wet rock on conveyors to an Allis-Chalmers rotary dryer. Dried rock is stored in large bins for final shipment. Some of the phosphate is further processed at the Tenoroc plant by grinding.

Geologists disagree on the origin of Florida's land pebble phosphate field which, this year, is expected to yield about 12 million tons of the mineral. Most theories suggest that the rich area of about a half-million acres in Polk and Hillsborough counties was the bottom of a shallow sea that once was part of nearby Tampa Bay. Proof for this theory is offered in the form of remains of marine life often uncovered in the deposits during digging. Miners have found shark's teeth as big as a man's hand, vertebrae of many types of fish, whales' teeth and manatee (sea cow) skeletons.

But skeletons of prehistoric land dwellers have also been discovered in the diggings. Huge mastodon jaw bones with molars intact, mammoth tusks more than ten feet long and the teeth of saber-toothed tigers have been uncovered in the same places as the marine life fossils.

The common grave of this strange and motley collection of animals, concentrated for thousands of centuries, became nature's mineral storehouse.

Many of the more soluable minerals dissolved, and the phosphate became more concentrated forming what is now estimated to be a five billion ton deposit, or about 19% of the world supply. The pebbles, found embedded in clay and sand, vary in size from almost microscopic particles to stones as large as a goose egg. Mining and recovery processes are different and more economical than those used in the higher grade, hard rock deposits that occur elsewhere in the country.

Earliest efforts to mine the phosphate pebbles were confined to dredges which dug the mineral out of river beds. When pebble deposits were discovered underground, men with shovels and wheelbarrows and horse-drawn scrapers were used to strip the shallow overburden.

Coronet's origins in the Phosphate field can be traced to a day soon after the turn of the century when C. G. Memminger, a mining engineer, and E. C. Stuart, a real estate broker, were riding in a horse-drawn buggy along a wooded trail in Hillsborough county from Plant City to Mulberry. They

Wet phosphate rock is transferred from the processing plant to open-air storage areas by conveyors. Cleaning up a storage area at the Tenoroc plant is a Hough.

Among Coronet's top operating personnel are R. M. Wilbur (left), plant manager; J. J. Lewis, defluorinating plant superintendent; and R. R. Hicks, purchasing agent.

Supervising some 350 employees at the mine and plant are L. G. Wood (left), mining superintendent; J. L. Wester, assistant mine superintendent; R. G. Stockton, mining engineer, C. E. Mills, drying and shipping superintendent; H. A. Hickman, chief mine electrician; J. B. Taylor, master mechanic; and B. W. Galloway, administrative assistant to the plant manager.

stopped to watch a man drilling a well and noticed what looked like phosphate pebbles coming out of the hole. They quickly realized that phosphate might occur in Hillsborough county as well as adjacent Polk county, which previously had been the only area to produce phosphate pebbles.

Memminger and Stuart secured options on land comprising the present Coronet site and adjacent areas, and after careful prospecting, raised capital to buy the land and build the necessary plant. Construction was completed in 1908. Houses built for key employees from lumber cut on the property are still in use today. Mining operations began 50 years ago near the site of the present Coronet plant with about 100 employes producing 100,000 tons a year.

Several years later the mining equipment was moved to Hopewell deposits, ten miles from Coronet, and wet phosphate rock was hauled by company-owned locomotives from the mine to Coronet for drying and shipping. In 1914 the compay purchased the Pembroke property, about three miles north of Fort Meade, where a very high grade deposit had been found. Mining, drying and shipping facilities and quarters for employees were all located at the Pembroke site where operations were continued for 15 years in conjunction with activities at the other two sites.

In 1929, the Pembroke plant was shut down and later sold, and all mining equipment transferred to another high grade deposit one mile east of Mulberry, known as Mary Lee. Mining started in 1929, and wet phosphate was hauled by rail to Coronet for drying and shipping. There had been no mining at Coronet for several years, and mining at Hopewell was discontinued from 1932 until after the Mary Lee deposits were mined out.

Prior to the Mary Lee operation, mining was accomplished by the use of steam shovels and hydraulic methods. It was in the Mary Lee operation that the first dragline was used, Bucyrus-Erie model 375-B rail-mounted machine. After the Mary Lee deposit was mined out in 1938, all mining and washing equipment was again moved to Hopewell where operations were resumed until 1947. Several years after moving back to Hopewell, a second dragline, a 7-W, was purchased. In 1947, all mining equipment was moved from Hopewell to the Eleanor deposit, located several miles south of the previous operation. The Eleanor deposit was mined out in 1951, and mining and washing equipment was moved again, this time to the present Tenoroc site in Polk county near Lakeland.

Build Plant

Shortly after operations began at Tenoroc, a 9-W dragline was purchased. All wet phosphate had been transported from the mines to Coronet by company-owned locomotives or the Seaboard Air Line Railroad, for drying and shipping, except from the Pembroke mine, which had its own drying and shipping facilities. But due to the greater distance of Tenoroc from Coronet and the increased tonnage to be mined from this deposit, a large and modern drying plant was constructed at Tenoroc (Coronet spelled backwards) in 1952, and all drying, grinding and shipping operations were transferred from Coronet to the new location.

Prior to World War I, a plant was built at Coronet for the production of calcined phosphate which was used by the chemical industry for many years, both in this country and abroad. The demand for this product decreased, however, and during World War II this plant was utilized for the production of mineral supplement, used in animal and poultry feeds as a substitute for bone meal, which was in short supply. Since that time, vast improvements have been made in this process which have necessitated many changes and additions to the plant, and the product now being produced is defluorinated phosphate (CDP), an important part of Coronet's present production.

The possibility of commercially recovering fluorine from the defluorination operations was recognized early in the development of this process. Research and pilot plant tests were conducted for several years, but it was not until the spring of 1956 that a plant was built for recovering fluorine and producing potassium silico fluoride (KSF) on a commercial basis from the kiln gases of the defluorinating plant. The potassium silico fluoride is produced with a minimum purity of 98.5%, and meets rigid color specifications for use in the enameling industry.

In the summer of 1952, Coronet was purchased by the Smith-Douglass Co., and is now operated as a division. The company owns extensive phosphate reserves, and continued prospecting is being conducted to develop additional reserves. Local administrative offices of

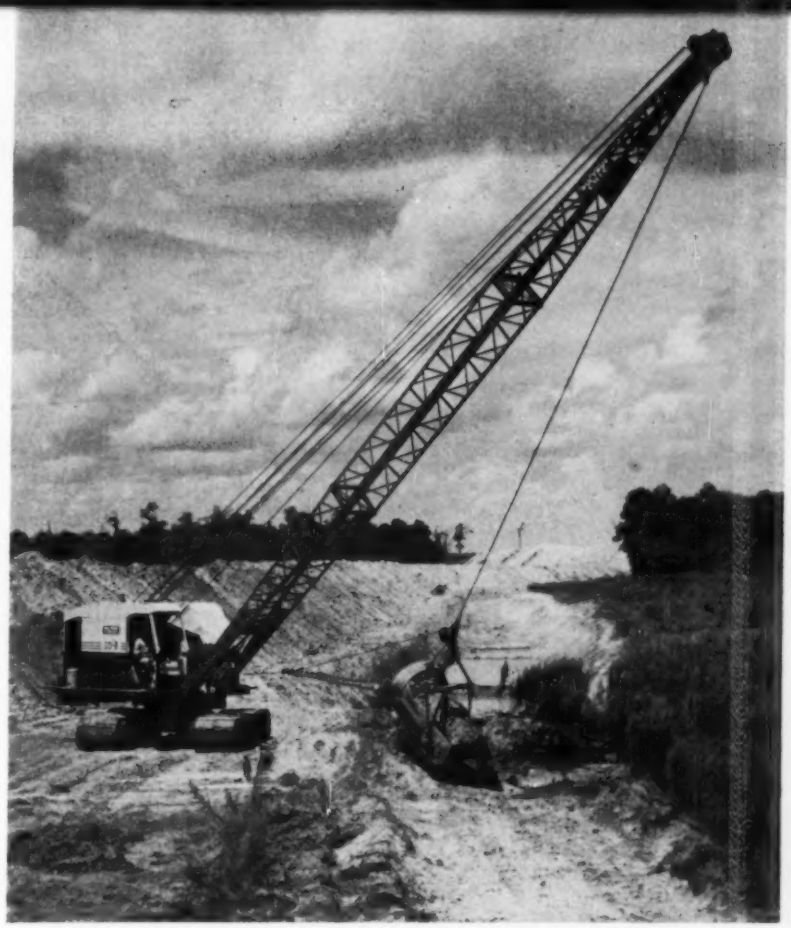
the division are at Coronet where the company maintains a picturesque village.

Company-employee relationships have always been harmonious. There are now approximately 350 employed at Coronet and Tenoroc many of whom have been with the company from 25 to 45 years. All production and maintenance non-supervisory employees are members of the International Chemical Workers Union, Local 37.

The first president of Coronet Phosphate Company was A. A. Cowles, followed in 1916 by C. G. Memminger who served in that capacity until his death in 1930. A. B. Grafius served as acting president until 1941, when J. R. Sheffield became president. He was succeeded in April 1954 by R. S. Rydell who is now a Smith-Douglass vice-president in charge of the chemical division of which Coronet is a part.

Management Team

R. M. Wilbur, a 28-year employee, is manager of the Florida operations. Other key personnel are R. H. Farmer, production manager for the chemical division with headquarters in Norfolk; J. J. Lewis, defluorinating superintendent; Henry Highton, sales manager; L. G. Wood, general mining superintendent; C. A. Hollingsworth, technical director; E. G. Padgett, chief engineer; D. B. Underhill, chief chemist; and W. F. Wooten, office manager.



This dike, built by a small dragline carrying a 1-yd. bucket on its 60-ft. boom, will confine sand and clay waste material pumped from the processing plant for disposal.

At Coronet, Fla., is a picturesque company village. Lumber for some older homes came from original mine clearing operations.

Dredge Uses Aluminum Anchors

by John W. Anderson
U. S. Army Engineers District, Vicksburg, Miss.

OLD time river boatmen and salt water sailors aren't likely to believe a sizeable boat can be anchored with a lightweight aluminum anchor, but that is just what's used by the dredge *Jadwin* of the U. S. Army Engineers, Vicksburg (Miss.) district.

Of course, the Army Engineers use a few tricks to place these aluminum anchors, but the holding power relies directly on this lightweight metal.

The *Jadwin's* mission is primarily to keep the Mississippi River "crossings" deep enough (minimum depth of 9 feet) for commercial tows passing through its assigned portion of the river. This stretch is roughly from the mouth of the Arkansas River to the mouth of the Red River. These tows may be 200 feet wide and 1,200 feet long, and may carry 30,000 tons of freight or more.

Dredging a crossing amounts to digging a 300-ft. wide ditch through the shallow area to a depth of 15 to 20 feet and from 1,500 to 6,000 feet in length. In some cases the crossings are longer. River current is especially swift at these spots, and the *Jadwin* must have a means of steady slow movement along a designated path.

To follow this path a pair of anchors —one on either side of the cut to be made—are placed far upstream with about a mile of cable from each anchor to the dredge. Hauling in on these cables moves the dredge upstream along predetermined line. The anchor must withstand about 35 tons of pull without dislodging.

Easily-placed lightweight aluminum anchors act as mooring points for dredge cables.

Formerly, these mooring points were 10-in. triple-strength steel piling about 50 feet long, with a connection approximately 12 feet from the bottom for fastening the cable. They were jetted into the river bottom by a stream of water passing through the piling and sunk to a penetration of 20 feet or more. The large heavy piling was difficult to handle and store, and when in place protruded well above the water offering a hazard to boats and tows.

The St. Louis (Mo.) Army Engineer District had begun the use of steel plate anchors and an adaptation of these was first made for the *Jadwin*. These, however, were heavy and difficult to handle rapidly by manpower. So, 1-in. thick aluminum plates 48 inches square were shop made with necessary fittings. They too are placed by water jetting and are turned in the diamond shape for easier penetration.

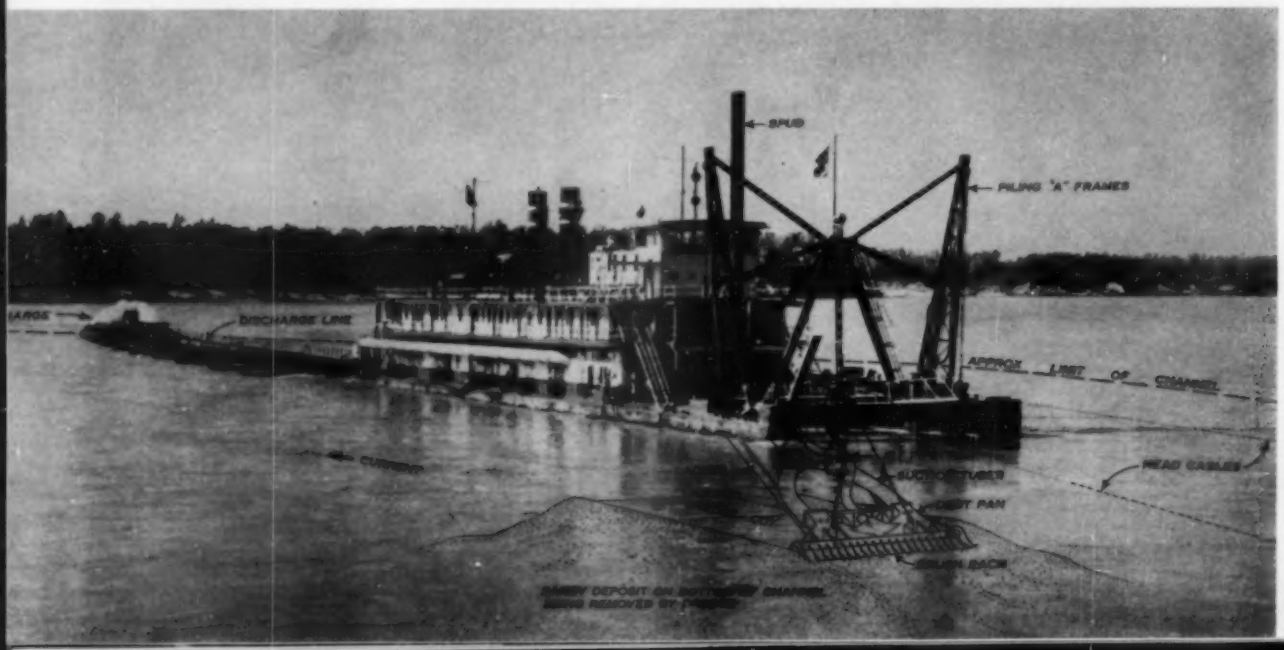
The 54-ft. long jet pipe is suspended from a fixed A-frame on either side of the bow and, when lowered to the bottom, a stream of water at 100 pounds pressure bores a hole 20 feet deep or more in the bed of the river in 10 minutes. The jet pipe carries the anchor plate down as it bores. Markings on the pipe show depth of setting. The locking pin is then pulled and the jet pipe is given a quarter of a turn, freeing the ears in the collar. The jet pipe is then withdrawn.

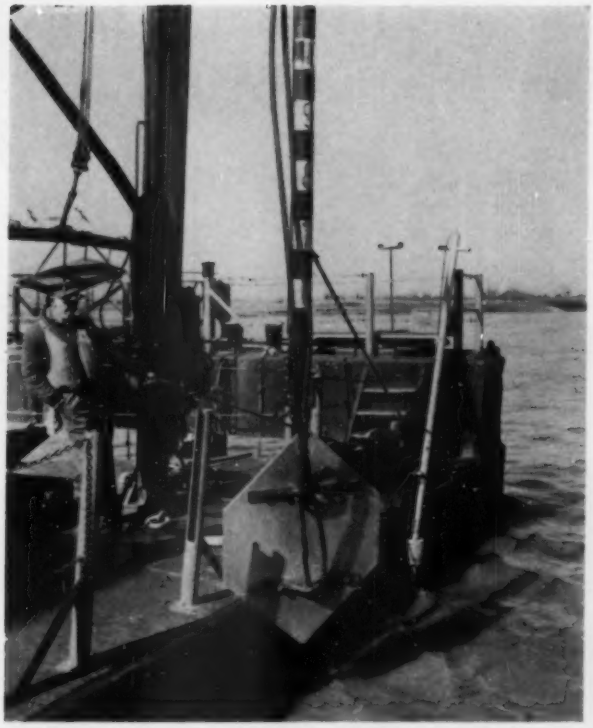
When the *Jadwin* moves to another work site, the anchor plates are easily pulled, since the top of the anchor bridle is well above center and tends to pull with the plate edge up.

Kedge and Danforth anchors had been considered; but often the bottom is composed of gravel at the desired anchoring spot, and these anchors would not always hold.

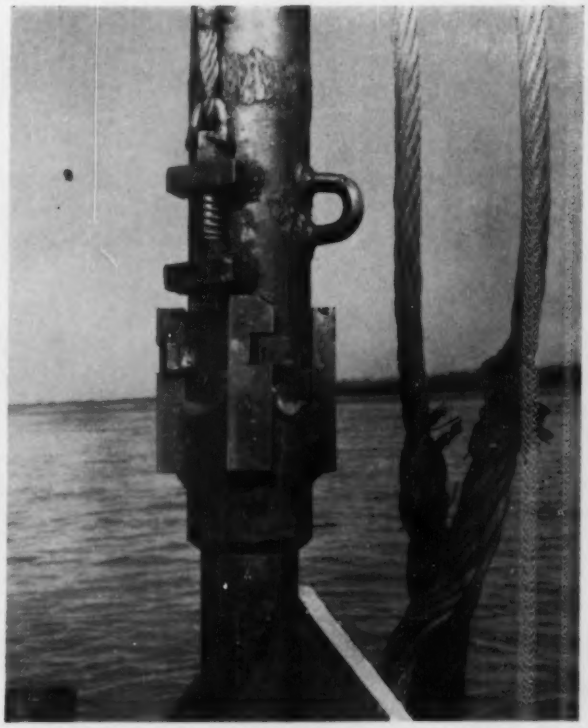
The *Jadwin* is a self-propelled, twin-screw, dustpan-type dredge with a 38-in. suction and a 32-in. discharge. It can dredge to a depth of 40 feet. The type name "dustpan" is derived from the similarity of the digging mechanism to a household dustpan. The leading edge of this 32-ft. wide pan carries twenty-six 1-in. water jets spewing at 40 psi. The jets stir up the sand and silt

Dredge *Jadwin* has a dustpan-type digging mechanism whose leading edge carries twenty-six 1-in. water jets that stir up silt.





(Left) Jet pipe carries the anchor plate down as it bores into river bottom. Pipe markings show depth of setting.



(Right) To separate anchor and pipe, a locking pin is pulled and the jet pipe is turned, freeing a set of ears in the collar.

so that the material can be picked up by the suction device. The suction pump is driven by a 2,500-hp steam turbine and the propelling engines are two 1,100-hp triple expansion steam engines. Steam is furnished by two generator-type boilers manufactured by Combustion Engineering Co., and operate at 350 psi.

The dredge moves approximately 3,000 net cubic yards per hour. It will produce about 1,500,000 cubic yards per month depending upon the number of times moves are made to different locations along the 270 miles of river.

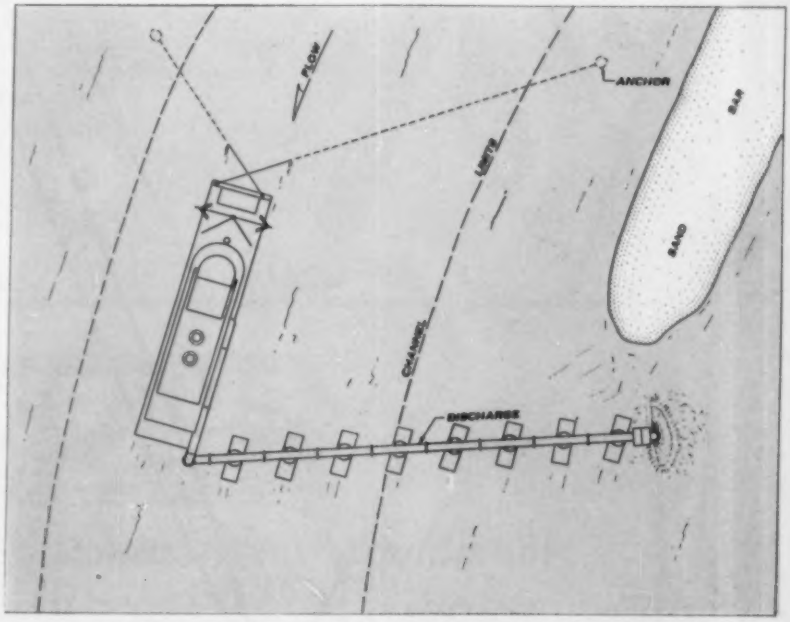
Pump Material Away

All of the dredged material is wasted to a location outside the channel limits and where the current will not wash it back into the channel. The material also forms a deflection dike to help align and deepen the dredged channel.

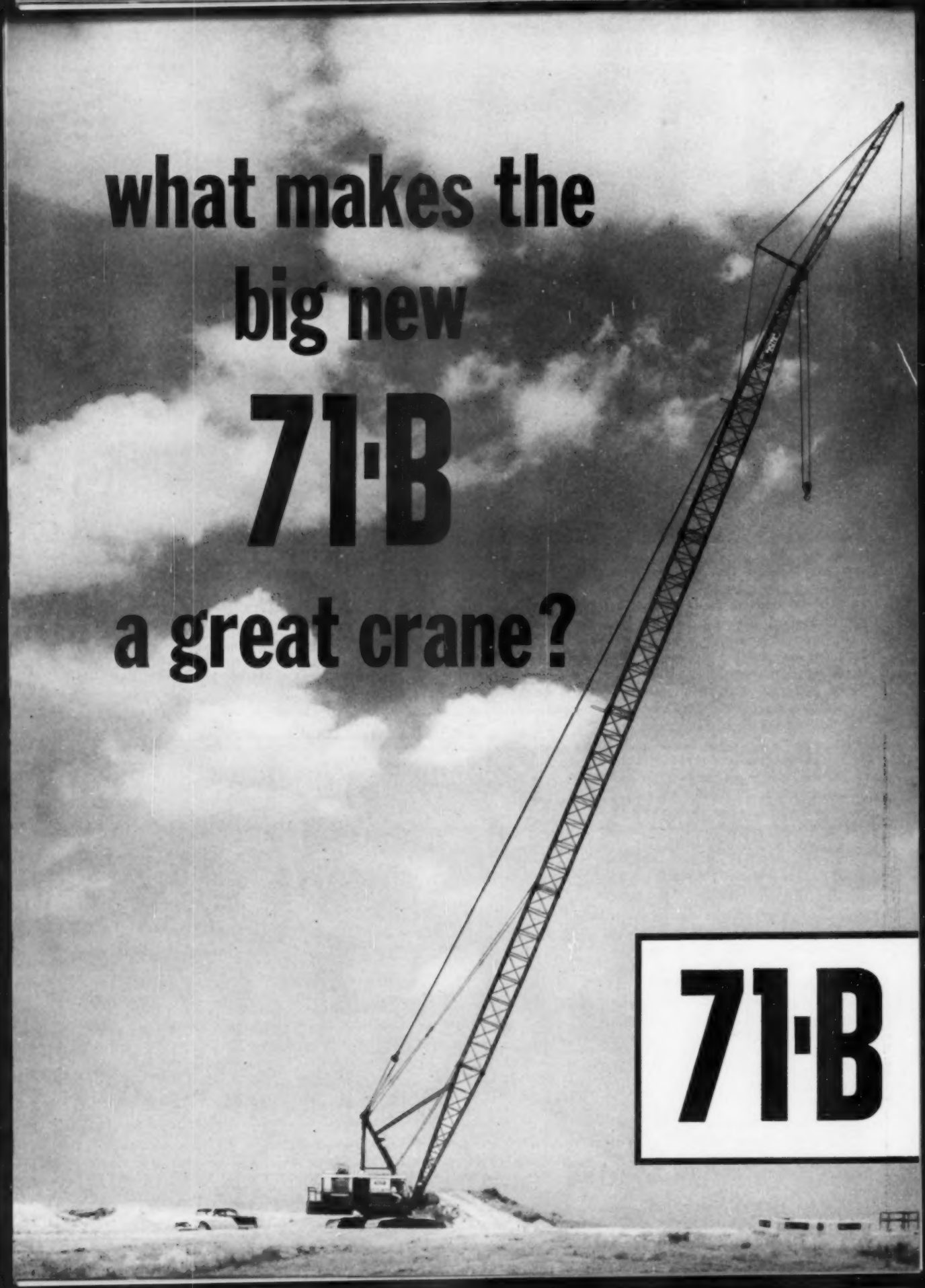
It is very important that the dredge cut be lined up with the natural flow pattern in a particular location—otherwise current across the cut would refill almost as fast as it was excavated. With good alignment, the current assists the work.

The floating pipeline, usually about 700 feet long, is not flexible and requires no moorings at intervals as do most dredge discharge lines. The *Jadwin's* pipeline, while rigid, is free to swivel about a vertical pivot at the stern on the starboard side. The position of the deposit is handled by the pipeline operator, who manipulates a deflection plate set in the stream of water at the end of the pipe. The force of the water moves the pipe by the same principle that makes a fire hose difficult to hold under pressure.

For the loose material encountered in most of the lower Mississippi River bed, the dustpan dredge is the most efficient type now in use.



For slow, steady movement, the dredge's crew places a pair of anchors upstream on either side of the cut. Cables attached to anchors are then hauled in by the crew.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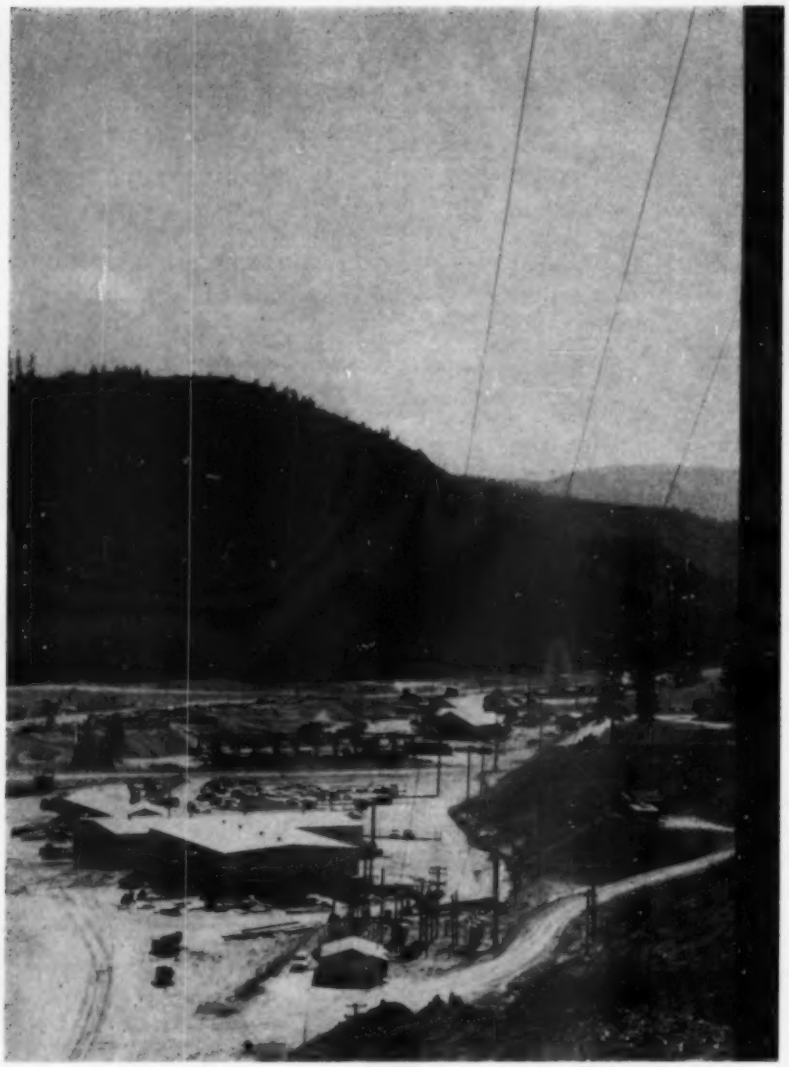


Trinity Dam Contractors' shops are headquarters of a model maintenance program. Some 180 mechanics, welders and oilers work under Equipment Supt. Ernie Ford.

Trinity Dam's Equipment Doctors

Expert team keeps a $9 million heavy equipment spread in like-new condition.

This is part two of a series of articles about the Bureau of Reclamation's Trinity Dam project. Last month's lead article described construction of the big embankment.

by Ray Day

SEVENTY percent of the contractor's cost of building Trinity Dam is directly related to equipment—its purchase, operation and maintenance. A $9 million fortune is invested in the machines which Trinity Dam Contractors are using. The investment in equipment is 20% of the contract amount. If the contractors should fail to maintain their equipment properly, the profit from this big job might well go down the drain.

These are hard truths. Nobody knows them better than A. H. Steiner, project manager, and his equipment superintendent, Ernie Ford. Ford has been with Steiner on many jobs, and over the years they've had a good chance to study equipment, what it will do, how it will behave under peak production performance, and what steps are necessary to maintain it properly.

"Look at it this way," Ford explained. "I believe that any good contractor's general manager would tell you there are very few pieces of equipment which you can buy for work like this for under $40,000. Some cost much more. One of our electric shovels has over a quarter-of-a-million dollar price tag. The investment in equipment becomes so staggering that maintenance was never more important.

"It's true that machines are being built bigger and better, and will turn in higher production rates and possibly work more hours before they begin to break down, but none of them will go very far without maintenance.

"And it's not just enough to finish a job like this with the equipment ready for the junk heap, either. We intend to finish Trinity Dam with this equipment still in top working order. It's the only way this big investment in machines can be justified."

Company Policy

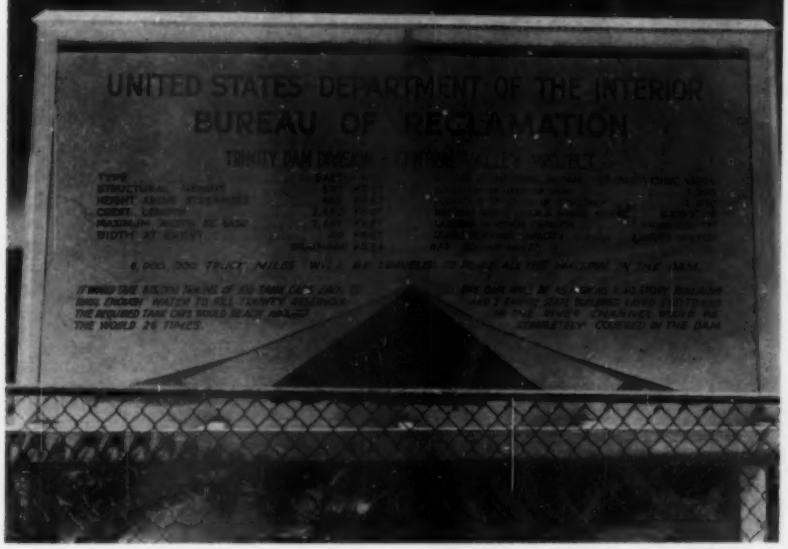
Defining Trinity Dam's basic equipment policy, Ford emphasized that it was not just something that he and Steiner had dreamed up, but rather was a result of their experience, integrated into Guy F. Atkinson's basic company policies. Both Ford and Steiner are Atkinson men, and the Atkinson company is sponsor of the five-firm combine joint-venturing the $49 million project.

Other members of Trinity Dam Contractors are Ostrander Construction Co.; M. J. Bevanda Corp.; A. Teichert & Sons; and Charles Harney, Inc.

The dam they are building is a giant. Its 33 million yards of earth and rock will hold back 2½ million acre-feet of the unruly Trinity River near Lewiston, Calif. It is being built for the Bureau of Reclamation, and in addition to providing irrigation water for arid California lands, it will provide 96,000 kilowatts of hydro-electric power.

Through Company President George Atkinson, a method of working and taking care of equipment has been developed which works about like this:

There is a record kept for every piece of equipment, however big or small, from the time of its purchase until the



This statistical summary of information about the dam is posted at the visitor's observation point. The project is impressive—and so are the spreads of equipment.

time of its final sale or disposal. During that time the fuel and other supplies it consumes, the cost of all repairs and parts it takes are recorded.

This is only one of half a dozen ways in which top-flight executives can see at a glance what equipment is costing, and balance it against what it is producing. It is one of the main essentials of modern contracting, of course, since contractors do not produce a product at a fixed cost while simply adding on their profit to sustain themselves. Equipment upkeep costs are a constant variable in a contractor's battle.

Defining the policy still a little finer, Ford explained that a unit system of maintenance is practiced by considering equipment as a unit, their engines as a unit, their drive mechanisms as a unit, and breaking that down still further until only the small occasional odd part becomes individual. A chain saw is considered a unit. So is a clutch assembly.

Preventive maintenance is practiced daily, every two weeks, at 500 operating hours, and at 1,000 operating hours. The machine getting a 1,000-hour checkup really gets the works. Nothing is missed, even a new paint job. The forms which the company has developed over the years, and uses religiously, attest to that. Everything that manufacturers recommend is on these forms, and this also is tempered by Atkinson's experience. "Tempering," as used here, does not mean that the items are missed. In general, the Atkinson company gives a machine far better preventive maintenance than its manufacturer recommends.

Some 180 men work under Ford in the PM program. First of all, there is a master mechanic on each shift, whose responsibility and authority is complete.

Fix Responsibility

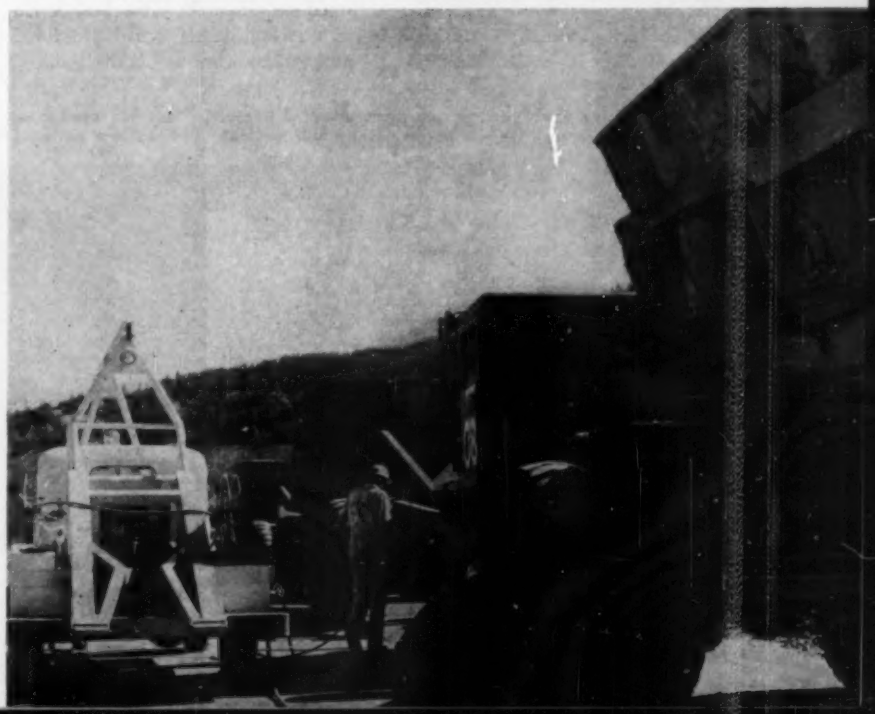
Under each shift's master mechanic is a shop foreman, a welding field foreman, and each foreman's crew of mechanics, welders, oilers and other service men. Even the oilers on machines like the big electric shovels work for, and are charged, against the equipment superintendent's department. It prevents divided authority between departments and places control of the shovel's operation in proper hands. On each shift also, there is a lubrication superintendent and foreman who reports to the general superintendent and master mechanic.

On the two operating shifts in which work is being done, there is a shop engineer who keeps all records, makes out shop timecards, answers radio calls and schedules all preventive maintenance. The schedule is unusually complete and well organized. Equipment due for a two-week, 500 or 1,000-hour checkup is published on a schedule each Friday. A copy of this schedule goes to every field superintendent and foreman who uses that equipment, so that he knows when and at what time the following week he will not have the use of units due for mechanical work.

Ford also is assisted by a man who is a graduate mechanical engineer. Practically every machine on Trinity Dam has been altered or changed to some extent, and on such extensive changes as this, they are always engineered, discussed and drawn up at least in rough-plan form. The equipment engineer integrates his work with a special equipment department which Atkinson maintains at its South San Francisco (Calif.) office. As a rule, the drawings from Ford's field office come out quickly, accurately and are of great assistance to the office at South San Francisco.

This is an organization of good men. Many of Ford's topnotch mechanics have followed him from job to job; many others are hired locally as necessary from union halls. Ford has personally interviewed every one of his

The secret of long tire life is shown here as servicemen make a daily check of each tire on the job. These units are 30-yd. Southwest trailers pulled by Internationals.



employees, some persons at great length.

Before any mechanic goes to work, he has at least a two-hour instruction session from the shift's master mechanic or his foreman. In this instruction session he is told all about company policy with regard to preventive maintenance, the quality of work is emphasized, and the man is impressed with the importance of asking questions about anything not familiar to him. One of the stock expressions around the shop is "Nobody was ever canned for asking a question. We have dismissed men, though, when they made needless mistakes without asking questions."

During the first part of his employment, each new mechanic is carefully supervised in a never-ending training program. It has been said truthfully that a year's work under Ford will make even the best mechanic better. Ford spares no time or trouble to broaden all his men. Training meetings are held at least once a month, the latest literature from manufacturers is disseminated and special training films are constantly shown in a meeting room which is complete with projectors and speakers. Sometimes during the slack seasons, Ford even orders films more on the entertainment side. Not long ago, for example, his mechanics found out through an Atomic Energy Commission film how atomic energy is produced.

The shop these mechanics work in is second to none. Everything is organized and integrated for efficiency, ease and comfort. The main shop has a central-aisle system so that an incoming machine, after it passes through a steam-cleaning process, can be taken directly to any one of 18 heavy-equipment repair stalls. The entire area is serviced by three overhead electric cranes, one of 25-ton capacity. One of the latest innovations is an electronically-controlled automatic washer recently installed, which will wash down one of the large earthmoving units in about 1½ minutes.

The shop also includes a paint room, a welding shop with four bays, a shop for the automatic rebuilding of track rollers, a tire shop, electrical department, and a mechanical department. The purchasing agent's office and the office of the chief storekeeper are so close to Ford's desk that talk-through windows permit the men to stay in constant communication with each other. There is also a tire shop in the main building.

One of the most important things which every new employee learns, and no old employee forgets, is the importance of card records maintained by this organization. The hours each piece of equipment works each day is turned in on the foreman's timecard, which in turn is ledger posted once each week. This, together with hour meters on certain equipment, furnishes a basis for the hour logs of each piece of equipment.

Warning System

Each folder is so arranged that the top half of the equipment card is red. As an equipment card has hours posted weekly, it gradually comes up in position in the folder until the top portion of the card shows red. It is then time to estimate exactly when the machine will have, say 500 hours, and make arrangements for inspection and other work to be done.

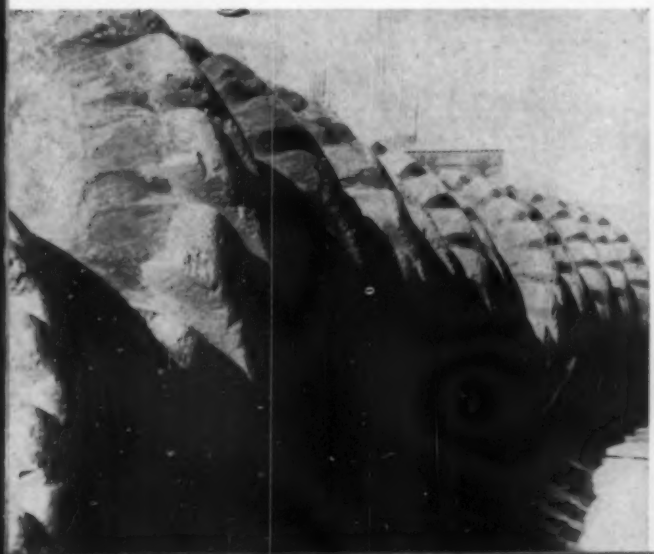
Shop work is governed by repair cards arranged on an eight-sided lazy-Susan board. One side of the board is devoted to scrapers, another to motor graders,

another to shovels and cranes, and so on. The hours of mechanical labor and all parts are promptly entered on these cards, which become a part of the master record for that piece of equipment.

There is even some card work on worn out parts. No old part is ever thrown away or discarded. Old parts are carefully tagged and put on an inspection bench, which is one of the most important pieces of furniture in Ford's establishment. By inspecting this bench frequently, Ford finds out if any part shows up repeatedly.

For example, suppose a certain bearing begins to show up repeatedly on the discard bench. In such cases, Ford promptly starts investigating and checking from a mechanical engineering standpoint the cause of such failures. It doesn't take long to find the cause of real long-lasting trouble in this way, and to take the steps necessary to cor-

(Left) This isn't a tire graveyard as the picture would imply. Although these tires have been worn down, they will be sent out for recapping, and will serve another day. (Right) Big tires are pulled off a haul unit by a truck front-end hoist.



(Above) Scrapers are hauling a large part of the 33 million yards of dam embankment. Bulk of the earthwork, in progress since 1957, will be completed this year.

(Right) There's no possibility of tire damage on haul roads like this. The road leading toward the dam from a distant borrow pit is polished by motor graders.

rect it. If parts from the discard bench can be rebuilt to work another day, that is done. If not, they are disposed of only after Ford specifically authorizes that course.

Tires are so expensive and so important a part of modern construction work that their maintenance is decidedly important. On the Trinity project, there is a daily inspection of every tire, a daily airing which checks pressure, and a record of each tire which is so complete that Ford knows all the time where each tire is and on which wheel. While some business is being done with other tire companies, most Trinity tires are supplied by Goodyear. Goodyear furnishes the job many of its Rock Lug tires, and also, with the contractors' cooperation, is experimenting with several new types of construction models. These tires are being tested under various speeds and in different materials. All tire maintenance is done by contract, either by shipping the worn units out to Goodyear or to Rogers Tire Co. of Yakima, Wash.

The fact that the contractors have tire service life as good or better than the average for the whole construction industry is traceable not only to this daily preventive maintenance care but to good operation as well. The 40-ft. wide, beautifully polished haul roads which are maintained constantly by motor graders are some of the easiest on tires of any construction project in America.

There is a spotter at each shovel who brings the machines in just right for perfect loading. His job also is to prevent the drivers from backing in over large, sharp, jagged rock. There is also a tractor and dozer at each shovel for the purpose of keeping approaches smooth and free from rocks. Another good operating stunt which favors tires is the building up of hauling units with sideboards so that loose rocks do not spill over to become a menace on haul roads. All this, of course, helps to get the most out of a tire and reduce its operating cost per hour.

One Supplier

The company has standardized on one manufacturer for supplying all fuels and lubricants to the Trinity project. Richfield Oil Co. has this contract. Trinity Dam's fuel trucks pump 15,000 gallons a day, to keep the machines on this project busy biting into the borrow pits.

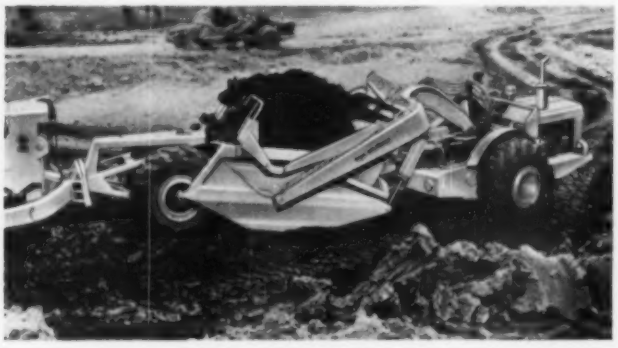
Oil is being used in bulk, rather than drums. Bulk oil for motors, transmissions, etc. is brought in by tank truck and is delivered to storage tanks which keep it perfectly clean. This has eliminated the usual handling of drums, as well as the cluttering confusion of caring for these containers during the life of the contract. Three fuel trucks dispense diesel fuel and gasoline to the units in the field.

A different type of engine oil change method is being used on the Trinity project, as compared to many other construction jobs throughout the country. Instead of changing engine oil strictly on the basis of work hours, the company changes on the basis of fuel consumption. Records are so carefully kept that it's easy to see at a glance when a machine has used sufficient fuel to warrant an engine oil change.

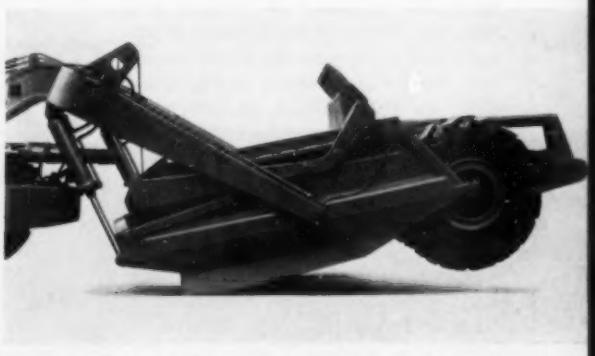
Perhaps nothing on a modern construction job is any more important than proper hardfacing of metal parts on equipment which slide through abrasive dirt, sand and gravel. Such parts include the corner angles of dozers, dippers and teeth on shovels, tractor

Continued on page 40

The TS-260 has powered its way into leadership...



The TS-260's 230 horsepower provides more than 18 horsepower per struck yard... 30,000 pounds of rimpull at 1.9 mph.



The TS-260 is the only scraper in its class to offer positive down pressure on the cutting edge for fast, easy penetration into hard-packed materials.

...move ahead with

THE ALLIS-CHALMERS TS-260

Eats Up Big Yardage Faster than Anything in its Class

All over America, the 17-cu-yd TS-260 in action is convincing construction men that here's the top dirt hog in the medium-sized motor scraper field. It'll convince you, too—with its profit edge in horsepower, rimpull and exclusive positive penetration at the cutting edge.

One of the most commanding features of the TS-260 is its new Allis-Chalmers 16000 engine. This big, new power package delivers 230 horsepower at 2,000 rpm . . . more than 18 horsepower per struck yard of capacity . . . up to 12 percent more than most other units of comparable size. The 16000 engine also offers unmatched efficiency and fuel economy—result of controlled turbulence produced by a combustion system unique in the construction machinery field. There's over 30,000 pounds of rimpull in low gear . . . up to 25 percent more pull than others in the 15-yard class at normal loading speeds.

Only Allis-Chalmers offers positive hydraulic down pressure on the cutting edge. In the loading cycle, this means fast, easy penetration even into hard-packed material for big 17-cu-yd loads. Double-acting scraper jacks also provide full power for rapid lifting of loaded scraper bowl. Result—faster getaways for loaded scrapers, faster work cycles.

When the ground gets soft or muddy, KON-TORK differential automatically goes to work *shifting power from the wheel that slips to the wheel that grips* . . . enables the TS-260 to walk right through axle-deep mud if it has to. KON-TORK differential also permits normal steering and complete control of the unit when varying torque is being delivered to drive wheels.

The TS-260 is loaded with other important performance and production advantages, too. Original, low, wide bowl with curved bottom reduces loading resistance . . . speeds loading cycles. Smooth 90-degree turning ability permits 180-degree turns in less than 31 ft . . . an air-actuated transmission brake lets operators upshift swiftly and surely without double clutching.

Your Allis-Chalmers dealer will be glad to show you all of the high-performance features on the TS-260 . . . and to prove their worth in an actual demonstration on your job. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wis.

in performance, dependability, profit for its owners

When the going gets tough, KON-TORK differential automatically shifts power from the wheel that slips to the wheel that grips . . . keeps the TS-260 moving through the muddiest going.

KON-TORK is an Allis-Chalmers trademark.

ALLIS-CHALMERS...power for a growing world

PRODUCTION-minded construction stiffs get "second conscious." That term means that it's very important to get a job done in the least practical amount of time, and that seconds actually count in production. So it is at Trinity Dam, as men try to reach a balance point between maintenance time and production time.

While Ernie Ford traveled over the job recently, a radio crackled. It was the voice of General Supt. Joe McNabb explaining that one of the key scrapers was being serviced by a field lubricating unit. That part was all right. What wasn't all right was the fact that the fuel truck wasn't there, too. By not staying up with the grease truck, fuel men were causing two delays to production where only one was really necessary. Couldn't something be done about it?

"It sure can," was Ford's answer. "I'm going up there right now."

That simple, little balancing relationship between two vitally necessary parts of a project will probably result in an extra load or two a day from these units. It takes exactly that kind of alert common sense to administer any maintenance or production part of a modern, big contract. Trinity Dam Contractors know how to pull it off every working hour.

Maintenance . . .

Continued from page 37

grousers, ripper teeth and scraper cutting edges. The list is not restricted to that; consider the tremendous amount of abrasion on sheepsfoot rollers, or the screens in a grizzly plant.

One thing which has been developed is a modern method for hardfacing, which takes into account the fact that not many welders know about the damage excessive heat can cause to high strength alloy steel. A dot system has been worked out which prevents overheat damage.

Special Techniques

Nucleus of the idea is this. Instead of running stringer beads, hardfacing beads in sergeant's stripes or chevron patterns or cross beads, Ford's system is a series of small hardfaced deposits of metal, spaced an inch apart. The pattern is not complex. Welders find it easy to do. What's desirable is to have a dot of hardfacing metal which will permit the travel of abrasive material only an inch in any direction. The dot system, applied to dipper lips, for example, prevents excessive buildup of welding heat at any point. Strangely, too, the system seems to make things last much longer than older methods of complete beads.

The chief job for the equipment maintenance crew on the graveyard shift is that of hardfacing. On practically every graveyard shift, the bright blue flash of an arc can be seen on the night sky, as welders apply extra dots to points of abrasion.

While the big 150-B electric machines do not get special treatment, they are set up for maintenance checks which keep them operating at peak performance. A daily check is made on each of these machines by the shift master mechanic, and by the foreman in charge of production on the machine. Every weekend, too, the electrical system is gone into and cleaned thoroughly. Each of the 150-B's is protected by an air cleaning and conditioning system, designed to keep dust out of the cabs and to keep it at an absolute minimum in circuit breakers and other electrical contact points.

A 500-hour check also is scheduled for these shovels, and the 1,000-hour check covers everything. The machines at this point get a new paint job, an overhauling which misses nothing, and even the large gears underneath are carefully inspected.

If there is such a thing as never-ending maintenance, it can be applied to the 2½-mile conveyor belt line which moves impervious-zone material down a 25% grade into the dam area. Material this belt transports is principally clay and disintegrated rock—a deadly combination which will almost make bugs creep into a conveyor system even when there were none.

One of the things which showed up first was the use of metal chutes at the transfer points. This was promptly changed by installing transfer belts, which work better and require less maintenance. Two crews work on maintenance constantly, under the supervision of a general belt superintendent and a

A pump setup along the Trinity River provides high pressure water stream for washing mud off undercarriage of a hauling unit.

foreman on each shift. Under this foreman are mechanics, who patrol the belt route in four-wheel-drive Jeeps. These little machines and Dodge Power Wagons are the only ones which can move over the steep terrain safely.

The Barber-Greene idlers which carry the belt on its loaded and return journey are so well sealed that they need grease only once in six months. The 25 to 300-hp General Electric induction motors also have proved to be very dependable. One of the serious bugs was a time lag on loaded belts going downhill, which permitted the conveyor to overspeed for a short time if it was shut down. This problem has been solved by the installation of big fans on the induction motor shafts, which hold a steady braking force of 100 horsepower against the downhill load.

It's a steady maintenance job, too, for the rubber maintenance crew. It repairs nicks, tears and other damage to the belt.

Spare Parts

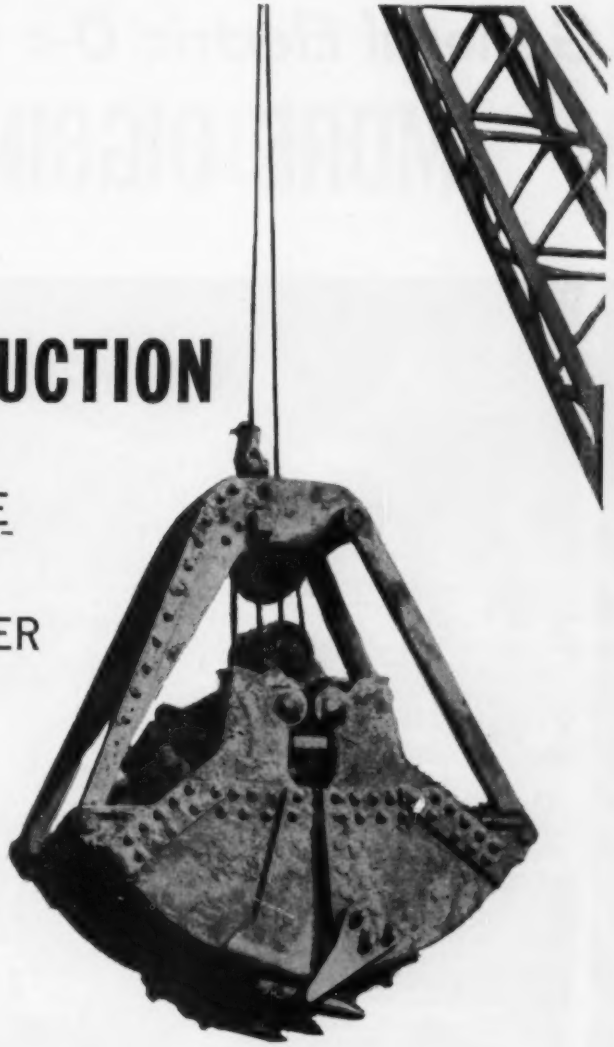
One of the strong maintenance assets is the practice of keeping spare units handy. They can be installed in short order in emergencies. For example, there's a spare engine for every major piece of equipment.

For hauling units, spares include radiators, engine, converter, clutch assembly, transmission, drive line assembly, rear end, planetary transmissions, and spare wheels and tires. On end-dump trucks there are also spare pumps, hoists and jacks. And everything else in the spares program is in proportion.

The shop was so well organized, the job was working so smoothly, when *Excavating Engineer* visited the job that we asked Ernie Ford to tells us at least one example of how he'd slipped, somewhere along the line. Was preventive maintenance ever missed? Was there anything on the job which had seen its best days?

"Sure. We have one piece of equipment which is obsolete, broken down, and has been patched up, amortized and broken again. We don't have a spare for it, either. You couldn't guess what it is. It's that electric coffee percolator in my office. To keep a fleet like this going, it takes plenty of black coffee. Some joker dropped the top off the percolator, and you know how percolator tops always break. So we wrapped it up with electrician's tape and it still kept going. It's the worst-maintained piece of equipment on Trinity Dam. Everything else is okay."

GET
ALL
THE
PRODUCTION
YOUR
CRANE
CAN
DELIVER



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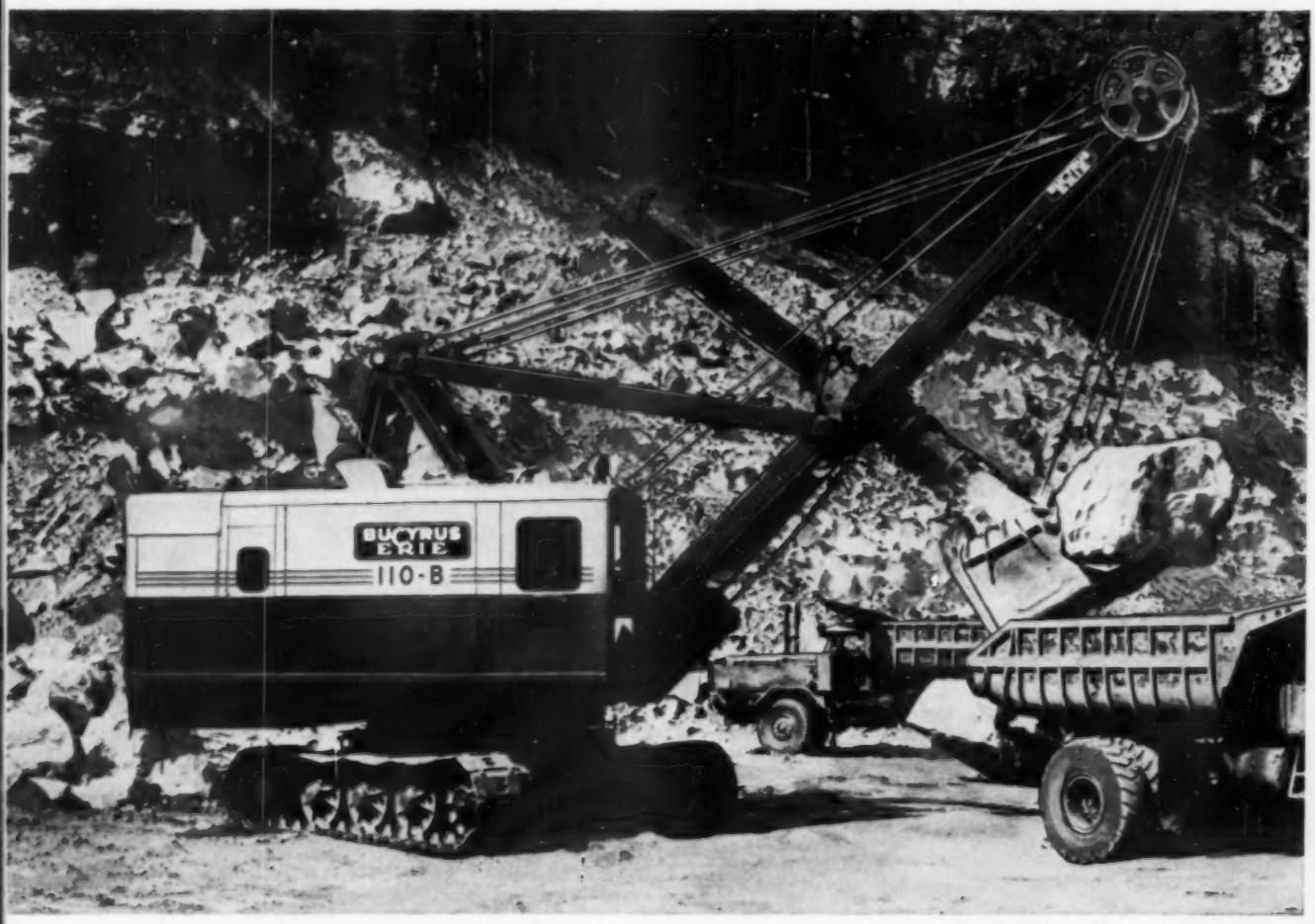
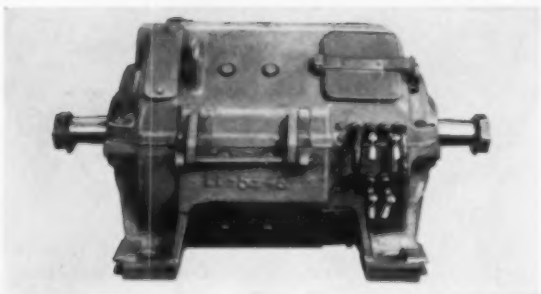
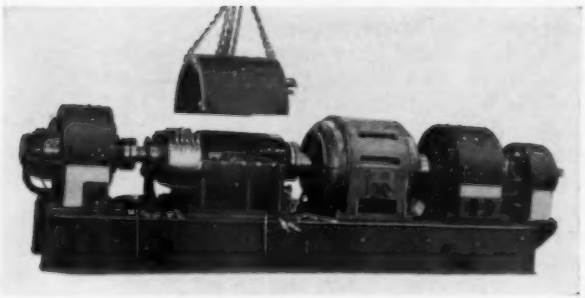
General Electric D-c Drives Give . . .

MORE DIGGING POWER AND





G.E.'s high torque, low inertia direct-current MD motor has large air gaps and advanced insulation system for temperature stability, greater power, and efficiency.



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General Electric engineers are available to help solve your electric drive problems, your distribution and mill requirements.

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ERIE, PENNSYLVANIA

News from the Field

Hold Services for W. Trent Ragland, Sr.

Last respects of the construction industry were paid to William Trent Ragland, Sr., in August at funeral services held at Raleigh, N. C. Mr. Ragland, 64, was shot to death August 9th by an intruder at his Wake County cabin retreat on the outskirts of Raleigh.

Mr. Ragland had been prominently identified with the aggregate industry in North Carolina all his life. At the time of his death, he was chairman of the board of the Superior Stone Co., a division of the American-Marietta Co., Chicago, Ill.

Known to his friends and associates by his middle name, Trent, Mr. Ragland gave generously to many causes, but always kept his identity anonymous in connection with such gifts. He participated actively in political affairs.

Mr. Ragland and his brother, the late Edmond Urquart Ragland, formed Superior Stone in 1939. The company grew substantially over the years. It was also doing business in the states of Georgia, South Carolina and Virginia at the time of the merger with the Chicago parent firm earlier this year.

Mr. Ragland was president of Superior Stone until 1954, when his son William Trent Ragland, Jr., took over the post. He continued on as board chairman. His son retained the presidency of Superior after the merger.

Trent Ragland was born in Little Rock, Ark. His parents moved to North Carolina when he was a young boy. He attended the University of North Carolina. His father was in the stone business in Salisbury, N. C., as well as in Raleigh.

Besides his son, he is survived by his wife, Alice; another son, William R. Ragland, also of Raleigh; one sister, Mrs. Edgar B. Neff of Little Rock; and five grandchildren.

Managers of the Mississippi

The mighty Mississippi has been called a river with a dual personality. Depending upon its mood, the Mississippi is either a "devil in the ditch" or an "angel in disguise." Shifting, winding, eroding, it dumps its billions of tons of water ceaselessly into the Gulf of Mexico.

At Cairo, Ill., 534 river miles north of Vicksburg, Miss., the Ohio and the upper Mississippi rivers join to form the lower Mississippi.

Taming the lower portion of this "devil in the ditch" and keeping him securely in his shackles is the responsibility of a body of seven men. These men, appointed by the President and confirmed by the Senate, form the 80-year-old Mississippi River Commission, a U. S. Army Corps of Engineers agency.

The Commission began its annual low-water inspection trip on Oct. 5th, starting just above Cairo at Cape Girardeau, Mo.

Charged with making the lower Mississippi valley safe from floods and improving the river as a navigation artery, the commission was created in 1879 by act of Congress. It made its first inspection trip that year. Each year since, the commission has made semiannual inspection trips during the highwater season in spring and the low-water season in fall.

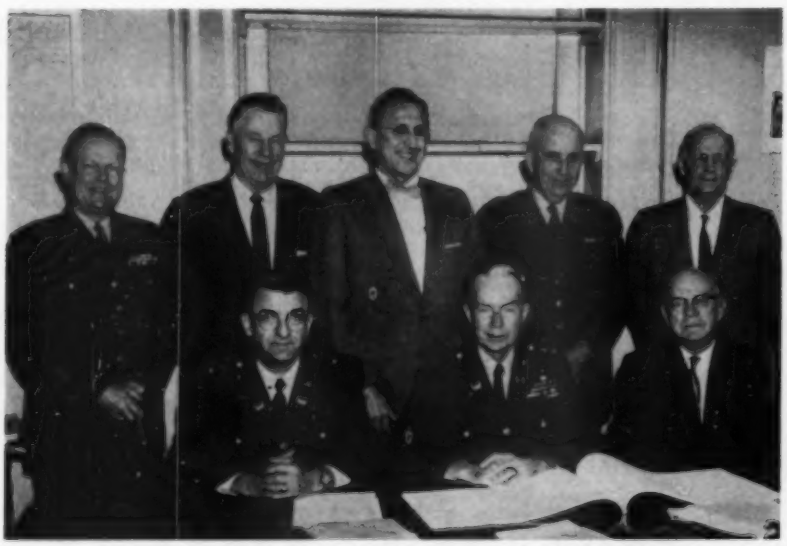
The present members, who might well be called the managers of the lower Mississippi River, are: Maj. Gen. W. A. Carter, USA, president, Vicksburg, Miss.; DeWitt L. Pyburn, Baton Rouge, La.; E. F. Salisbury, Kansas City, Mo.; Rear Adm. H. Arnold Karo, director, U. S. Coast and Geodetic Survey, Washington, D. C.; Harry L. Bolen, Cairo, Ill.; Brig. Gen. William W. Lapsley, USA, division engineer, U. S. Army Engineer Division, Ohio River, Cincinnati, Ohio; Maj. Gen. Keith R. Barney, USA, division engineer, U. S. Army Engineer Division, Missouri River, Omaha, Neb.

On their inspections, the commissioners make a 1,000-mile trip downriver on the Steamer *Mississippi*, one of only a few remaining paddle-wheel steamers on the river. The deep-throated, three-toned whistle of the steamer heralds the steamer's approach to each landing where stops are scheduled.

There local officials, levee board and drainage district officials, barge line interests, businessmen, farmers and others come aboard to greet the commissioners and find seats in the improvised meeting hall in the main cabin of the boat where public hearings are held.

Questions of importance to be put before the commissioners concern maintenance of flood control works, higher levees, new revetment, deeper channels, improved drainage and the like.

Most spectacular accomplishment of the body has been in making flood control a reality. A 1,600-mile system of giant earth levees, cutoffs which have



Mississippi River Commission members are (seated, left to right): Brig. Gen. W. W. Lapsley, Maj. Gen. W. A. Carter and DeWitt L. Pyburn; (standing) Col. L. B. Wilby, Harry L. Bolen, Rear Adm. H. A. Karo, Maj. Gen. K. R. Barney and E. F. Salisbury.

straightened Mark Twain's meandering river and lowered flood stages; concrete revetment of the riverbanks to prevent the Mississippi's wandering; and other features such as reservoirs on the tributaries, floodwalls, dikes, and pumping stations are combined to give the lower Mississippi Valley successful flood protection.

But navigation was the commission's earliest concern. Today, with deep-draft tows pushing strings of barges often a fifth of a mile long, maintenance of a navigable channel is of even greater importance. Revetment is helping to accomplish this, and dredges carve channels through shallow sand "crossings" to keep the river open.

It will be 255 years next year since the first international cargo floated down the Mississippi—a load of 15,000 bear and deer hides bound for France. The river has come a long way since then, and cargoes have changed. Nowadays it's oil and grain, coal, stone, sulphur and steel—bulk commodities suitable for transportation in huge barges pushed by sleek modern towboats travelling a deep and safe waterway.

Industry is moving to the lower Mississippi, too, in a steady march with a Dixieland beat. Attracted in part by an awakened, progressive South that is "on the move" but more attracted by the abundance of water and bulk transportation afforded by the river, hundreds of new industries have moved into the area in the past few years. Aluminum plants, oil refineries, huge chemical plants, furniture and textile mills—a diversified industrial complex is rising in what was "cotton" country.

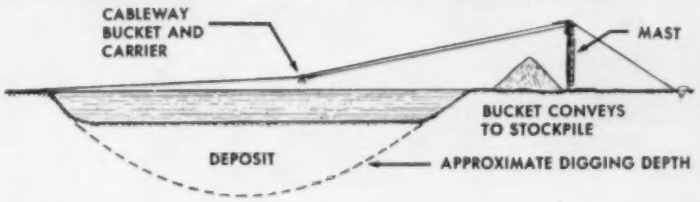
Of particular interest to the commissioners while making the low-water inspection has been a progress check of work at the Old River Control site, just below Natchez, Miss., where a plan of improvement is under construction to prevent the Mississippi from behaving in an especially devilish way. It has been trying to change its course and flow to the Gulf of Mexico through Old and Atchafalaya Rivers. This diversion, which offers the waters of the Mississippi a shorter route to the Gulf, would also isolate Baton Rouge and New Orleans from their present advantageous position on its banks.

These and other matters are the concern of the Mississippi River Commission as the Mississippi becomes more and more important to the future of America. It's paradoxical—this steamboat trip along the silent Mississippi in the

Continued on page 48

The Best Method for Digging Under Water is a Sauerman Slackline Cableway

... R. W. Bisett, Pres., Olean Gravel, Inc.



A Sauerman Slackline Cableway has been excavating material for Olean Gravel, Inc. since 1930. The 1½-yd. bucket has an operating span of 1200 ft., with an average haul of 900 ft. Depth of the pit is approximately 85 ft.

Due to the long haul and digging depth, Olean uses shovels at the shore line to supplement the Slackline and maintain the 200-tph. capacity of their new plant. Mr. R. W. Bisett, President, states:

"No one has yet come up with a better way of getting material from below the water line than Sauerman."

During freezing winter months when the plant is not operating, the Slackline Cableway is kept running to build a stockpile of material. A 110-ft. mast permits building the pile to a height of about 75 ft. All digging, elevating, conveying and dumping operations are handled by the hoist operator. Gravity return of the bucket to the excavation completes the fast operating cycle.

Where long range excavation or deep digging is required, it pays to use a Slackline Cableway. Contact Sauerman for specific recommendations on your job. Catalog C, *Slackline Cableways*, gives more information on this materials handling method.

SAUERMAN BROS., INC. 622 SO. 28th AVE. BELLWOOD, ILL.
Linden 4-4892 • Cable CABEX–Bellwood, Illinois

Crescent Scrapers • Slackline and Toutline Cableways • Durolite Blocks

MORE OWNERS IN MORE BUYING MORE MARIONS OUTPUT AND PROFIT GO UP GO DOWN WITH A MARION

CALIFORNIA — Model 111-M 4½-yd. shovel excavating on Castaic dam site.

MONTANA — A model 37-M ¾ yd. shovel loads shot rock in talc mine.

MINNESOTA — Model 43-M pile-driving with 3,000-lb. hammer on sewer projects.

TEXAS — A 25-ton, 35-M truck crane, with 75' boom and jib combination, removes cement forms on 1¾ mile long bridge.

INDIANA — One of two 43-Ms working on a 6-mile by-pass near Indianapolis, this dragline carries a special bucket on 50' of boom.

PLACES ARE BECAUSE AND COSTS ON THE JOB

FLORIDA — With a 2-yd. dragline bucket on 60' of boom, this Model 362 is dredging at major residential site.

OHIO — Model 43-M 1-yd. backhoe working on sewer project.

TODAY'S MARIONS GIVE YOU MORE IN SUSTAINED, LOW-COST PERFORMANCE

MACHINE	Shovel Capacity	AVAILABLE AS				
		Hoe	Crawler Crane	Truck Crane	Wagon Crane	Special Crane
35-M	¾	Yes	Yes	Yes	Yes	—
37-M	—	—	—	Yes	Yes	—
43-M	1	Yes	Yes	Yes	Yes	—
362	1½	Yes	Yes	—	Yes	Yes
93-M	2½	Yes	Yes	—	—	Yes
101-M	3	—	Yes	—	—	—
111-M	4	—	Yes	—	—	—

ALABAMA—Model 93-M recovers iron ore. It carries a 2-yd. bucket on 60' of boom.

CONNECTICUT — Killingley Thruway is helped along by this 101-M 3-yd. shovel.

NEW JERSEY — $6-million high school construction job handled by Model 35-M, ¾-yd. backhoe.

MARION POWER SHOVEL CO., MARION, OHIO

A Division of Universal Marion Corporation

You get **MORE** *with* **MARION**

News . . .

Continued from page 45

jet and missile and moon-rocket age. But it makes a lot of sense. Witness the lesson taught by the river itself—a great rushing, plunging flood brings only destruction, while the steady, orderly flow made possible by manmade improvements brings benefits for all.

Military Transporter Patterned After Earthmovers

A new type of off-road transport vehicle, capable of delivering military supplies across-country to widely dispersed, fast moving units of the atomic age army, was demonstrated recently at Fort Knox, Ky., for army research men.

The giant rubber-tired machine, dubbed the "Goer" for its "go-anywhere" mobility, is a strict departure from conventional army trucks and transporters. Instead of following the historic pattern of being a military development which might one day be adapted to civilian use, it is essentially a "plowshare hammered into a sword."

For the most part, Goer design principles and components have been adapted from those which have given mobility, agility and durability to commercial earthmoving machines in the United States since before World War II. The Goer features two-wheel prime mover; articulated, wagon-type electric steering; high ground clearance; springless suspension; rugged, simple power train; and six-ft. tall rubber tires.

Conceived by the members of the Continental Army Command (CONARC) Armor Board, the Goer was designed and built by LeTourneau-Westinghouse, Peoria (Ill.) equipment manufacturer, under the sponsorship of the Ordnance Tank Command, Detroit Arsenal.

During the day-long demonstration, two Goer prototypes—a 5,000-gallon fuel tanker and 15-ton cargo carrier, negotiated a series of rugged rough-terrain problems which proved impossible for a fleet of conventional Army trucks and transporters. Fully loaded, the Goers climbed slopes, threaded their way between boulders, scaled a vertical wall, skimmed over a sand trap, snaked their way through hip-deep mud pits and topped the whole performance off by swimming across an inland lake.

According to L-W engineers, the machines demonstrated here today, represent basic standard components proven in the firm's commercial earthmoving equipment line, but assembled in a manner which creates an entirely new machine.

Peabody Mine to Get Wheel Excavator

A massive multi-bucket earthmover —Bucyrus-Erie's model 1054-WX wheel excavator—will go to work for Peabody Coal Co. next year. The $2.5 million machine will be installed at Peabody's River King mine, near Belleville, Ill.

Shipments of the base and lower works from the manufacturer's South Milwaukee (Wis.) plant to the mine began in September, permitting their erection this fall and winter. Delivery of various upper works components, commencing in February, should be completed in late April. Based on that schedule, it is expected that the wheel should be operating by mid-1960.

The towering wheel excavator will incorporate many features of the Kolbe unit, recently demonstrated by The United Electric Coal Companies during an open house program at Cuba Mine, near Canton, Ill. The rights and patents to the Kolbe machine have been acquired by Bucyrus-Erie.

The Peabody wheel excavator will stand approximately 150 feet in height, 390 feet in length and 50 feet in width. Its working weight will run over 3 million pounds. A fast-moving dual conveyor spoil system will be fed continously by a huge 24-ft. diameter revolving wheel equipped with nine 1-yd. self-cleaning buckets. Use of the dual conveyor belt system permits spoiling the material some 400 feet from the cut at a maximum dumping height of 128 feet—in one continuous, non-swing operation.

J. R. Hill Dies

J. Rutledge (Perch) Hill, 67, a noted Texas businessman, engineer and civic leader, died in Dallas September 10, following a heart attack. He was board chairman of the Gifford-Hill Companies, engineering and concrete firms.

Mr. Hill began his career in 1913, following graduation from Texas A & M College, as an inspector with the Mississippi River Commission of the U. S. Army Corps of Engineers. He later served as county engineer of Texas' Montague County before organizing a contracting company in 1921.

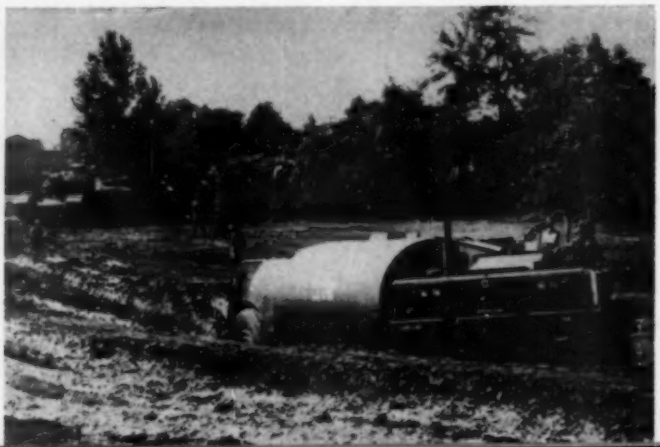
In 1926 he organized Gifford-Hill & Co., Inc., and served as vice-president of the firm until 1941 when he was made president. He was chosen board chairman in 1958.

Among the large Dallas County projects Mr. Hill's firm built are Hutchins Road, Denton Road, Midway Road, Seagoville Road and parts of Belt Line Road. He also handled installation of ore handling equipment at the Lone Star Steel Co. plant at Daingerfield.

Under Mr. Hill's direction, the activities of Gifford-Hill expanded to include plants in three states, which process railway ballast, sand, gravel and slag. The firm also operates ready-mix concrete plants in Texas, Arkansas and Louisiana.

A well-known figure in the excavating industry, Mr. Hill was a past president of the National Sand & Gravel Association and of the Texas highway branch of the Associated General Contractors. He also held numerous civic posts.

The "Goer"—a new army off-road transport vehicle—demonstrates its ability as a 15-ton carrier (left) and tank truck (right).



Equipment You Ought to Know About

Bottom-Dump

Manufacturer: Athey Products Corp., Department EE, 5631 W. 65th St., Chicago 38, Ill.

Claims: Athey has developed a new 35-ton capacity bottom-dump trailer for use with the Caterpillar DW21 tractor.

The new trailer is called the PW21, and has a third (or rear) door in addition to the two 3-ft. wide bottom doors. The third door, together with steep side plate angles (18° off vertical) and a high 5-ft. rear clearance, permits the PW21 to dump instantly with no "hang up" and allows the unit to ride out over —not through—the dumped load.

The PW21 is constructed entirely of high strength (100,000-psi) steel, and has a trailer weight of only 21,700 pounds with a capacity of 35 tons or 27 yards (heaped).

The 23-yd. struck capacity of the trailer and the 345 horsepower of the DW21 primemover give the unit exceptional gradeability and traction.

The PW21 is also equipped with a hydraulically-actuated door mechanism. Doors are locked—not merely closed. This relieves the hydraulic system of all load and eliminates haul road spillage. The doors are closed by a hydraulic ram driving a cable take-up. When dumping, doors can be opened instantly or slowly for spread dumping.

The PW21-DW21 team has speeds up to 27.9 mph and will make non-stop turns in 40 feet. This is a foot and a half less than the complete unit's length.

FOR 50 YEARS...
Finest in the Field!
Rely on the bucket contractors rely on. The Omaha Dragline Bucket gives full load with every cast. Perfect balance makes it easy to spot dump. Alloy steel cutting teeth stay sharp, tough and ready.
Strike pay dirt now!
Complete information and specifications await your letter.
DRAKE-WILLIAMS MOUNT • OMAHA, NEBR.
OMAHA
DRAGLINE BUCKETS

125-Ton Crane

Manufacturer: Manitowoc Engineering Corp., Department EE, Manitowoc, Wis.

Claims: Manitowoc's model 4000 lifting crane has a capacity of 125 tons at 17-ft. radius—biggest of any crawler-mounted crane. Its rotating base is heavy and massive, with huge hook and house rollers, for carrying the heaviest loads. Big, stable undercarriage and long, wide-spread crawlers provide a solid lifting foundation.

A major upper works feature is a big double-drum boom hoist of the self-locking worm gear type that cannot "free-wheel." On the rugged main drum, the external brake and internal clutch friction arrangement assure positive control. Extra-friction surface, disc-type swingers provide instant response to the operator's touch. Torque converter is standard equipment.

Basic boom supplied with the model 4000 is a new T-section 125-ton capacity boom. Extra long tubular booms are also available for maximum reach, lightweight lifting assignments.

Optional features include independent boom hoist, independent swing, high capacity gantry, automatic and pantograph boom stops, equalizer and pendant type rigging, and manual or air controls.

Overall compact design makes it easy to ship the unit as it can be put on a standard railroad flat car without ex-

Continued on page 54

NOT in the Contract

Pat had invited Mike for a ride on the back of his new motorcycle. After they had gone a few miles, Pat asked Mike how he liked it.

"Shur, and it's fine," said Mike, "but the wind is catching me in the chest."

Pat stopped by the side of the road and said, "Turn your coat around and I'll button you up the back. That should protect your chest."

They were going a good 90 miles an hour when they hit a truck a little later.

A constable was called to the scene of the accident. "Both dead," he said to the coroner who arrived a bit later. "This man here was dead when I arrived, and the other was breathin' until we twisted his neck around right."

The gust of wind had lifted the attractive young lady's skirt almost to her neckline. The shovel runner on the corner emitted a loud, appreciative whistle. Embarrassed but belligerent, the young lady snapped:

"It's obvious that you aren't a gentleman!"

"Well, it's obvious that you're not either," he replied.

A construction worker on a job in bitter cold weather in Montana climbed off his rig in the middle of a shift.

"Hey" yelled the foreman, "where are you going?"

"To get my safety hat," the worker answered.

"Okay. Where is it?"

"In Florida!"

A real gone Joe was ambling down Main Street when he spotted an organ grinder playing an old organ and holding a little monkey on a string. The Joe stopped and stared while the monkey begged for coins, danced and doffed his tiny cap.

"Man," said the Joe to the organ grinder, "I don't dig that music, but you sure got a crazy son."

The roustabout, although quite interested in girls, was an extremely shy young man. To make progress with the fairer sex, he was anxious to improve his lovemaking technique, but was much too bashful to discuss his problem with his friends.

So, while browsing in a bookstore, he was over-joyed to discover a volume entitled, *How to Hug*. The price was steep, but he bought it and rushed home, Only then did he discover that his purchase was Vol. IX of an encyclopedia.

Formula for a glamor girl: Take an average woman at a kitchen sink full of dirty dishes. Tell her to drop the dishrag and go to a beauty parlor. When she has had the full treatment, suggest that she buy a party dress and a pair of golden slippers. Then refer her to an expert who can choose the cosmetics that will enhance her personality. As a finishing touch, buy her an orchid. In only a few hours, what do you have?

You have a glamor girl—and a sink full of dirty dishes.

The case worker at the welfare agency in a small town was interviewing the wife of an oiler who asked for aid for herself and thirteen children.

"But I don't understand," said the case worker. "You say your husband deserted you ten years ago and yet eight of your children are under 10 years of age."

"Oh, I can explain that," said the oilers' wife beaming. "You see, he comes back now and then to apologize."

He: "I'm keeping a record of all the good times we've had together."

She: "Oh, a diary!"

He: "No, stubs in a checkbook."

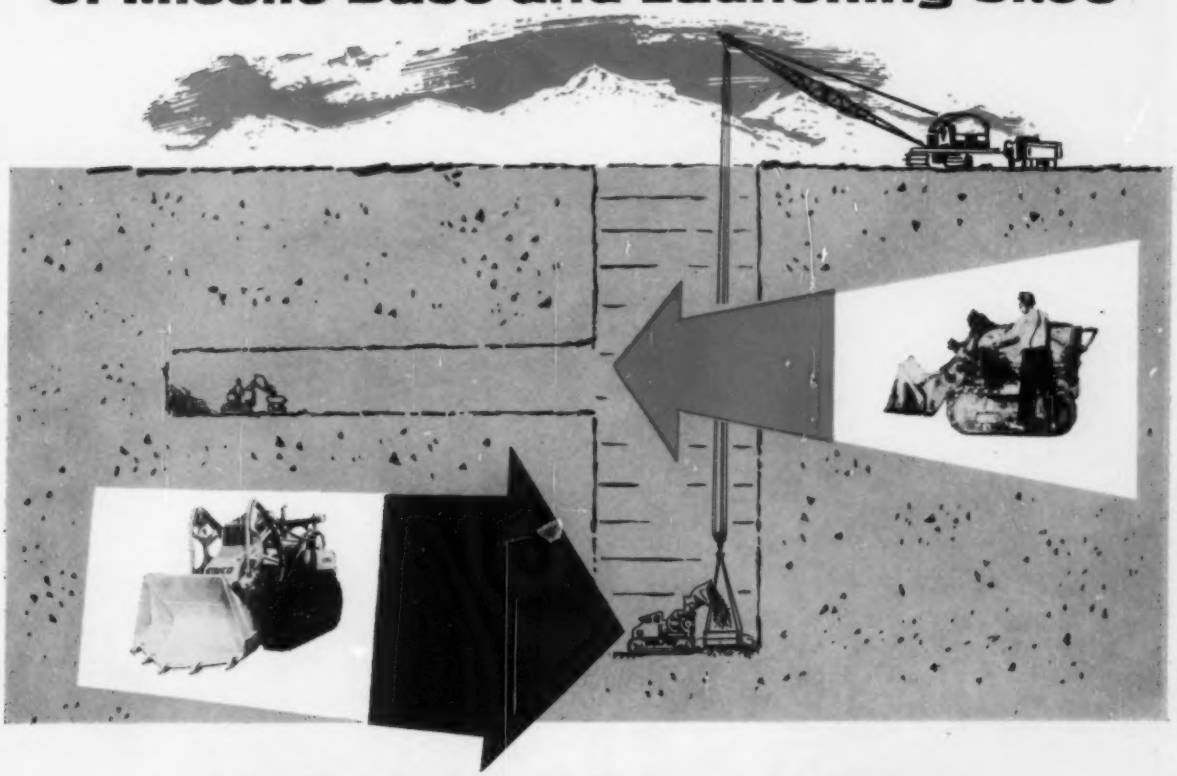
The small boy watching his uncle's newsstand for a few minutes, was approached by a man who asked him: "C-c-can y-y-you t-t-tell m-m-me w-w-where V-V-Vine S-S-Street is?"

The boy looked at him but didn't answer. The man stutteringly repeated his question, but the lad still refused to answer. Disgusted, the man dashed off. Another man who had been watching and listening to the monologue went over to the boy.

By-stander: "What's the matter, son?" Why didn't you answer that man?"

Boy (indignantly): "W-W-What! A-A-And h-h-have m-m-my nose p-p-punched!"

Economical, Efficient Construction of Missile Base and Launching Sites



On-The-Job Proven Solutions with the Eimco 105 and 630 Lines of Loaders

As the nation undertakes the building of underground ballistic missile complexes, American industry and ingenuity has already made available the specialized equipment necessary, and proven their efficiency in use.

Private enterprise has had to strive for utmost efficiency for low cost and large output in tunneling and excavating, both vertically and horizontally. Thus, when A. J. Cheff Construction Company won the subcontract for underground tunneling and shafts involved in the sinking of the Swift Creek 55 foot circular spillway and control shaft, they turned to a modern Eimco 105 Crawler-Tractor Excavator to do the job. The shaft was sunk to a depth of 950 feet, using one 105 excavator for all loadings of broken material from the shaft bottom.

The machine was lowered to the bottom onto the newly-blasted rock by an 80 ton mobile crane. The same crane was then used to lower and, after loading, hoist, a truck dump bed. Broken material was loaded on the shaft bottom by the Eimco 105, digging its way into the broken rock. Upon being hoisted, the dump bed load was dumped by swinging it into position over a Euclid truck, the "tag" line of the crane being used for dumping.

In shale, an Eimco 105 specially engineered short-coupled dozer with ripper attachment has been successfully used and in underground rooms, the excavator loads directly into a truck bed, carried on a flat-rack truck. Even in such tough assignments, the Eimco 105 excavator, which is diesel powered, showed a mucking rate as high as 125 cubic yards per hour!

In tighter areas, Eimco's famous 630 underground mining excavator, running on compressed air or AC or DC current, has proven its capabilities all over the world. With a production rate of 40 cubic yards per hour for the 630, production with either of these machines is limited only by the hoisting capacity available. The Eimco 126 Front End Loader has also proven itself as an efficient tunneling unit.

Thus, the combination of Eimco engineering and production knowledge and progressive construction company practices, has developed proven-on-the-job solutions to economical construction of intricate ballistic missile complexes and similar projects. For further facts, data and courteous, qualified consultation, write The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah.

"ADVANCED ENGINEERING AND QUALITY CRAFTSMANSHIP SINCE 1884"

THE EIMCO CORPORATION

EXPORT OFFICE: 51 - 52 SOUTH STREET, NEW YORK, N. Y.
BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

TRACTOR LOADER DIVISION

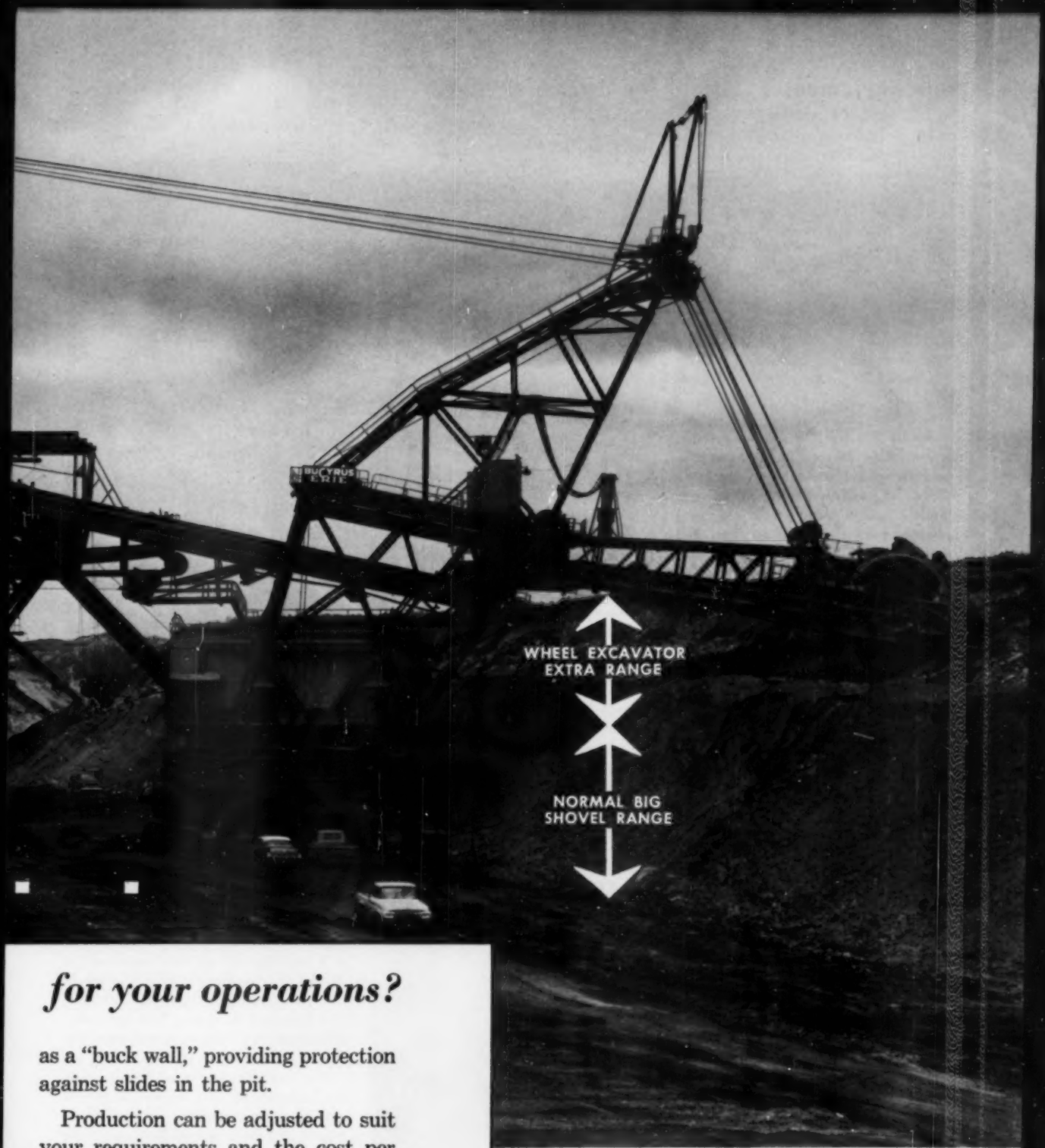
MEET THE WHEEL EXCAVATOR .

...have you considered this revolutionary machine

Take a close look at the unique abilities of the Bucyrus-Erie wheel excavator. Perhaps it is the answer to your large-scale excavating, stripping and high-volume dirt-moving problems.

In the coal fields for example, Bucyrus-Erie wheel excavators team up with present big shovels and make it possible to uncover veins previously too deep for practical stripping... thereby increasing strippable reserves and extending the use of present equipment.

The "wheel" can deposit the unstable material, normally occurring near the top of a mine cut bank, far back onto the spoil pile. The stripping shovel places the more stable material from the lower part of the bank at the bottom of the spoil pile where it acts



for your operations?

as a "buck wall," providing protection against slides in the pit.

Production can be adjusted to suit your requirements and the cost per cubic yard of material dug is lower than by any other method.

For details on how a wheel excavator may be applied to your operations consult Bucyrus-Erie Company, South Milwaukee, Wisconsin, Dept 5LA.

BUCYRUS ERIE®

Builds Better Equipment

New Equipment . . .

Continued from page 49

tensive advance preparations or dismantling. Self-removing counterweight with removing device further aids in weight and bulk strip-down.

Euc Tractor

Manufacturer: Euclid Div., General Motors Corp.; Department EE, Cleveland 17, Ohio.

Claims: Euclid's new model C-6 tractor is now in production, climaxing nearly five years of exhaustive testing on heavy earthmoving jobs and in mines and quarries.

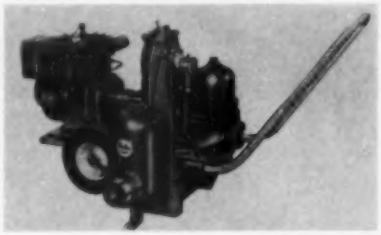
Completely new in its design concept, the model C-6 has 211 net horsepower. Its Torqmatic Drive consists of torque converter and a semi-automatic transmission that eliminates the master clutch. Changes from one of the three forward speed ranges to another, and from forward to reverse and back again, are made under full engine power. Smooth, positive track control is provided by a unique system of common braking and steering that requires no adjustment of steering clutches or brakes.

The rear-mounted cooling system results in cleaner operation and permits close mounting of front end attachments.

Front equalizer bar of advanced design gives both vertical and lateral support without the usual cross braces—constant track alignment is maintained under all working conditions. Track roller frames are pivot mounted on the main frame, eliminating all tractor weight from final drives. The track recoil system incorporates a gas accumulator and piston in place of the heavy steel spring commonly used for this purpose.

Standard track shoes are 22 inches wide; track gauge is 78 inches, and total ground contact area is 5,069 square inches. Bare operating weight is 42,000 pounds. Top speed, forward and reverse, is 7.9 mph.

Diaphragm Pumps



Manufacturer: Marlow Pumps Div., Bell & Gossett Co., Department EE, Midland Park, N. J.

Claims: Marlow has added two new models to its line of lightweight aluminum diaphragm pumps. An electric motor unit is known as the model 302B-EL, while a gasoline engine unit is designated as the model 302B-1.

Both units have 3-in. male-threaded suction and discharge. They use standard diaphragms and have replaceable rubber flapper valves. The valves and valve seats can be replaced quickly if required. The gear case and pump body are made of cast aluminum. The body has a readily accessible clean-out and drain hole. Either model is available as a base or wheel-mounted unit.

The electric motor driven model 302B-EL has capacities up to 71 gpm at 56 strokes per minute. While slightly more compact than the gasoline engine driven pump, the Model 302B-EL is 23 pounds heavier. The Model 302B-1, with a Briggs & Stratton 141302 engine, has a capacity of 76 gpm at 60 strokes per minute using a governed engine speed of 1,850 rpm. It weighs 158 pounds base mounted and 169 pounds wheel mounted. Both models utilize an oil-lubricated gear drive.

Pipelayer

Manufacturer: Caterpillar Tractor Co., Department EE, Peoria, Illinois.

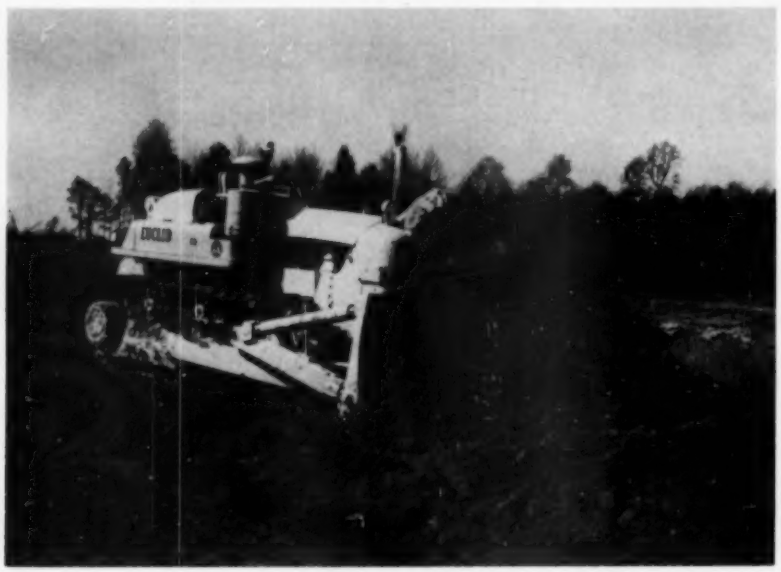
Claims: A new No. 572 series D pipelayer, engineered to have increased working ability and durability, as well as reduced servicing time, has been announced by Caterpillar.

Lifetime lubricated track rollers, carrier rollers and idlers are standard on the new model. These rollers and idlers are lubricated during factory assembly, and need no further lubricant until rebuilding.

Winch speeds have been increased for faster pipe handling. New line speeds are: first gear, 106 fpm; second gear, 214 fpm; and third gear, 513 fpm Lowering speed has been increased from 222 fpm to 230.

A noteworthy engine change has been the addition of a turbocharger, which aids in increasing engine flywheel horsepower to 140, a rise of 9.3% over the previous 128. Engine torque rise has been increased 80%, giving the new No. 572 tremendous lugging ability. Engine rpm has been increased from 1,200 to 1,240 to match the increased horsepower to the torque converter.

A dry-type air cleaner is now on the No. 572 engine, reducing servicing time 75% compared to the previous oil bath air cleaner.



World's Biggest Paver

Manufacturer: Koehring Co., Department EE, 3026 W. Concordia Ave., Milwaukee, 16, Wis.

Claims: A giant Koehring concrete paver can mix and pour a half mile of highway a day, 24 feet wide and 9 inches deep. The new 34-E Tribatch paver will revolutionize concrete production for highways and airports, according to Koehring officials.

The paver produces better than 40% more concrete than any other paver on the market, pouring about 250 lineal feet of standard 2-lane highway every hour.

It gets its name from a completely new concept in drum design. The Tribatch uses a 3-compartment drum for mixing aggregate, cement and water to form concrete. Present big-capacity pavers use a 2-compartment mixing drum. The net result is a decrease in cycle time from 42 seconds to 29 seconds, based on a mixing time of 60 seconds. That means approximately two batches of concrete (74.8 cubic feet) are produced every minute.

Despite the increase in capacity and operating functions, the new machine is easier to operate than dual drum pavers because of the Koehring Batchmeter. This is an electric automatic control of all mixing cycle functions, including raising of the skip, introduction of the water and operation of the transfer chutes and discharge chute. Safety devices prevent one function from taking over until all preceding functions have been fully carried out.

The Tribatch paver is also equipped with a new precision, pressure injection water system that greatly increases the speed of water delivery into the mixing drum. At the same time the injection system measures with extreme accuracy the amount of water furnished.

The paver is specially equipped with safety devices which will eliminate many of the accidents which sometimes occur on paving jobs. A safety device prevents the skip from being raised until released by the man directing batch trucks. Both the truck spotter and the paver operator have access to a "stop" button which will freeze the skip in any position until released. The batchmeter is constructed so that should any operation fail to function, all operations behind it will become static. There's no chance for material to pile up in one of the compartments. Also, the batchmeter will not allow the final discharge chute to open until the bucket is in position to receive the material.

The new paver was shown publicly for the first time last month at a state highway job in Milwaukee, where some 300 paving contractors witnessed a series of demonstrations.

Truck Line

Manufacturer: Ford Motor Co., Department EE, Dearborn, Mich.

Claims: Ford 1960 light and medium trucks incorporate increased operating and maintenance economy along with improved "cab-livability."

Plastic foam seat padding is sag resistant and new seat trim of vinyl, saran and viscose elements offer greater resistance to wear, improved moisture absorption and breathability. A larger and more powerful heater motor delivers 175 cubic feet of air per minute for faster cab warm-up.

Modern front-end styling includes a new hood and grille, both of which incorporate a horizontal design; rectangular integrated parking lights and twin headlights joined by a massive chrome bar forming the upper portion of the grille.

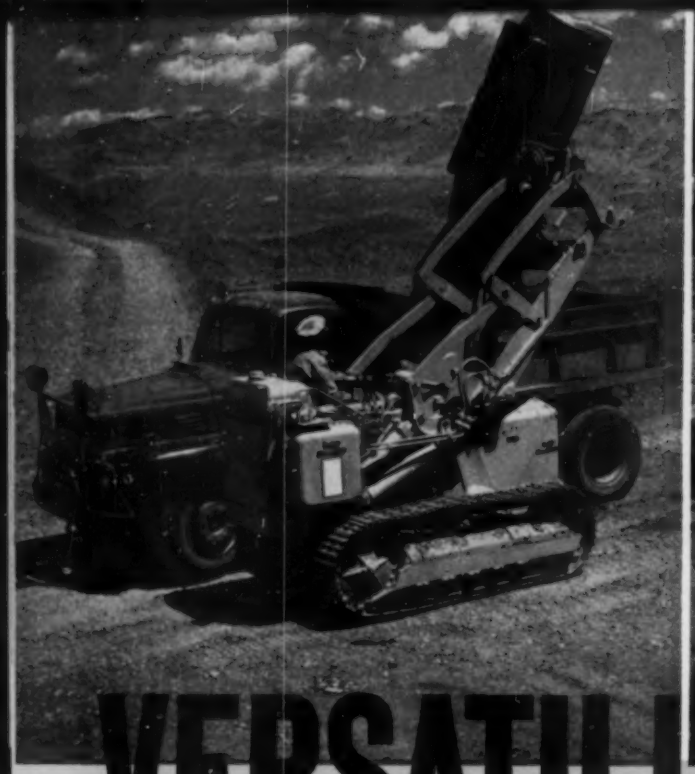
In the light trucks, Ford's F-100 pick-up offers increased frame rigidity

for greater chassis durability and improved riding and handling characteristics, particularly on rough and secondary roads. A choice of six pickup bodies in 6½, 8 and 9-ft. lengths with capacities up to 80 cubic feet is offered in light-duty models.

Available engines for the light and medium-duty trucks include the 223-cu. in. six-cylinder economy engine and Ford's 292-cu. in. V-8. All 1960 Ford trucks offer modern short stroke design engines. A wide range of transmissions and axles are also offered to satisfy every trucking need.

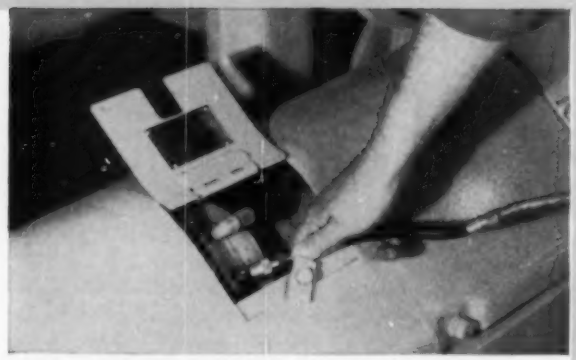
Typical of the new engineering advancements and special features available in Ford's medium truck line is the 1960 F-600. This vehicle offers a choice of 17,000, 18,000, 19,500 or 21,000 pounds gross vehicle ratings, with all

Continued on page 58

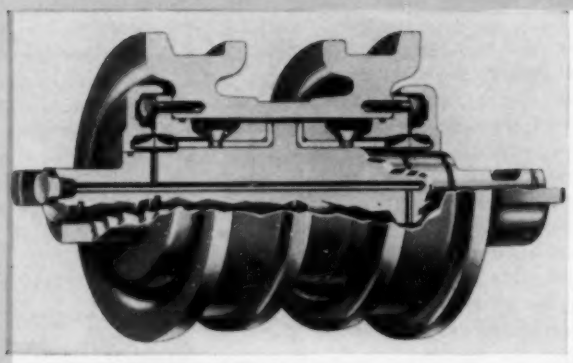


VERSATILITY SPEED

ADD UP TO TOP PRODUCTION

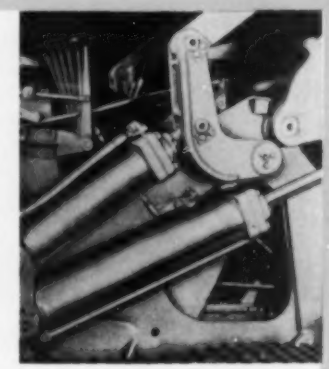


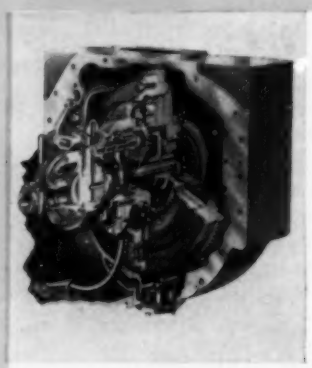
HYDRAULIC TRACK ADJUSTERS standard on the No. 977 and No. 955 —optional on the No. 933. An ordinary grease gun is all that's needed to adjust tracks. Just open the inspection door and apply a few strokes. The hydraulic cylinder does the rest.



LIFETIME LUBRICATED ROLLERS. They need no lubrication servicing until rebuilding. Heat-dissipating oil lubricant is retained by dirtproof floating-ring seal. Eliminate on-the-job roller lubrication. Keep machines on-the-go for longer periods of time.

SMOOTH-FLOW BUCKET CONTROL LEVER. The inside lever is pulled back, lifting the load. It locks in this position until it is kicked out at maximum height by the lift cylinder and linkage. After dumping, both levers are pushed forward. The bucket lowers but only tilts back to an adjustable, preset digging position. Linkage then kicks the outside lever, stopping the bucket tilt.





EXCLUSIVE CATERPILLAR OIL CLUTCH . . . the most advanced clutch design ever offered. Provides up to 2,000 hours without adjustment. This is equal to about 12 months of "adjustment-free" operation. And because wear rate of clutch facing is so slight, down time for clutch repair is almost eliminated.

DEPENDABILITY

IN A TRAXCAVATOR

WHATEVER THE JOB . . . whatever the conditions . . . there's a Caterpillar-built Traxcavator to take charge. Advance design has given this machine a reputation for speed . . . efficiency . . . low operating and maintenance costs. For this is a digging and loading tool; not a tractor attachment.

The line is complete. You get top production from three Traxcavators . . . the No. 933—52 HP, 1⅛ cu. yd. bucket; the No. 955—70 HP, 1½ cu. yd. bucket; the No. 977—100 HP, 2¼ cu. yd. bucket. And there's a complete range of quick-change attachments . . . special buckets, bulldozers, forks, the exclusive side dump bucket and the rear-mounted ripper.

Traxcavators are built to last. They have a heavy steel main frame, welded into a one-piece unit. Box construction track roller frame absorbs the loads and stresses of tough treatment. Lift arms are made to stand up under the strain of heaviest digging conditions.

Traxcavators give you fast action and ease of operation. Excellent stability and balance give better control of the machine. A fast hydraulic system cuts cycle time and increases maneuverability even in close quarters. Visibility is excellent. The high seat puts the operator on "top" of the work. Operator's compartment is uncluttered. Tractor controls are conveniently located for handling ease. Bucket controls are at the right armrest . . . closely spaced for dual operation with one hand.

The reliable Caterpillar Diesel Engine has a fuel-saving injection system and ability for hard lugging. Each engine is matched to the machine for power and bucket size.

All of these features pay off in top production. Let your Caterpillar Dealer help you choose the Traxcavator best suited for your job. Get production facts and figures. And ask for a demonstration.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

BOOST PRODUCTION AND LOWER COSTS WITH A VERSATILE TRAXCAVATOR

New Equipment . . .

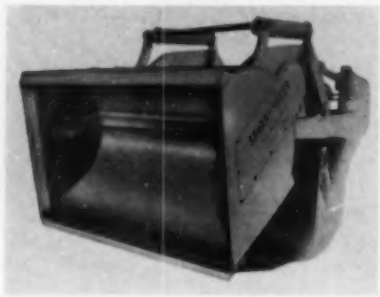
Continued from page 55

components engineered to give best performances at any one of these four GVW ratings.

Newly engineered brakes offer the F-600 operator superior braking performance with a 10% greater deceleration rate and 20% longer brake lining life. Tubeless 10x22.5 tires or 9 x 20 tube-type tires are available for both front and dual rear wheels.

All 1960 Ford trucks offer a selection of nine colors in Diamond Lustre enamel—which requires no polishing to maintain its high lustre finish.

Self-Cleaning Loader Bucket



Manufacturer: Shunk Mfg. Co., Department EE, Bucyrus, Ohio.

Claims: A new Shunk-Baker self-cleaning front loader bucket works on the simple but effective principle of the ice cream scoop.

The attachment is furnished in 1, 1½, 2 and 2¼-yd. capacities and is interchangeable with rear-hinge buckets on wheel or crawler front end loaders. It is designed to increase yardage in gumbo, muck, kaolin, sticky clay and other heavy wet soils. It eliminates dumping half-loads or stopping to clean the bucket by hand, in sticky material.

Using the self-cleaning bucket, the operator can maintain regular work cycles without time-consuming delays to "knock out" material. Elimination of this "knock out" operation also relieves the machine of shock-loading stresses, reduces wear on all working parts.

The bucket's special alloy steel scraper blade is ⅛-in. thick and operates on steel bushings. As the bucket dumps, the blade scrapes sticky material from the bucket interior in the same way that ice cream is sliced from a dipper. The chain-driven scraper is spring-loaded and can't be damaged by rocks or other hard objects. The actuating gear and drive chain is protected by flush-mounted cover plate and is easily accessible for tightening or adjustment.

International Crawler

Manufacturer: International Harvester Co., Department EE, 180 N. Michigan Ave., Chicago 1, Ill.

Claims: The TD-25 diesel tractor—most powerful crawler ever produced by International—now is coming off assembly lines.

The TD-25 is available in either a torque converter or gear-drive version. Both models are powered by International's DT-817 turbocharged engine—a six-cylinder, four-cycle, direct-starting engine developing 230 net horsepower at the flywheel at 1,500 rpm. Marking a major advance in equipment standardization, the International DT-817 engine is also used in other large International earthmovers such as the Payscraper, Paywagon and the Payhauler.

Four speeds forward and reverse are offered by the torque converter TD-25, which has a drawbar pull up to 70,000 pounds at 0.75 mph, with adequate weight and traction. Operating weight is 46,000 pounds.

The gear-drive TD-25, with an operating weight of 45,500 pounds, has a 46,700-lb. drawbar pull in first gear at rated governed speed. It has eight speeds forward and reverse.

"Get out of here with that thing!"

Heart of the International TD-25's operating efficiency is IH's Planet-Power system, which permits turning with controlled power on both tracks, with effortless, finger-tip steering. This engineering refinement eliminates power-wasting, "dead-track drag" in turns, permitting the fully-loaded tractor to turn smoothly, under positive control, whether working upgrade, downgrade or on the level.

A 24-volt, direct electric starting system activates the TD-25. Two head and one rear sealed-beam lights provide illumination.

Features of the tractor's cooling system are a 24-gallon, one-piece radiator, with 11.5 square feet of frontal area, mounted on four rubber pads; gear-driven fan; gear-driven externally-mounted water pump and an oil cooler.

Additional engine cooling is accomplished through spraying the underside of the pistons with a gallon and one-half of oil a minute when the engine is running. A separate heat exchanger on TD-25 torque converter models is used for stabilizing torque converter temperatures. Fuel capacity is 135 gallons.

From the standpoint of improved operator comfort, the new International TD-25 has a three-piece hood with heat deflectors built in to direct warm air away from the operator's compartment. The seat and arm rests are raised to improve visibility.

On the TD-25 torque converter models, the installation of a tachometer in the operator's compartment enables keeping the tractor in the most efficient gear range.

With standard 24-in. track shoes, the crawler is 104 inches wide. Its overall length is 196⅞ inches. Area of ground contact with 24-in. shoes is 5,652 square inches.

A complete line of control units, hydraulic or cable controlled blades, and pusher plates is available for the TD-25—the sixth new crawler introduced by International Harvester within a year.

6-KW Diesel Electric Plant

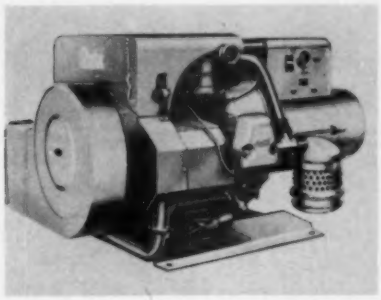
Manufacturer: D. W. Onan & Sons, Inc., Department EE, 2515 University Ave., Minneapolis 14, Minn.

Claims: Important design changes have been incorporated into the new Onan 6,000-watt air-cooled diesel electric generating plant.

The model 6DRN was developed primarily for general electric power applications by construction firms, mining camps, municipalities, oil fields and industry.

The generating set is powered by a new 13.5-hp Onan 4-cycle full-diesel engine. Dominant feature of this new engine is its VACU-FLO cooling system.

This highly efficient vacuum cooling system employs a powerful centrifugal blower that pulls cooling air through the generator and over the heated engine parts . . . then expels the heated air through a duct to the outside. This un-



usual cooling feature enables the diesel electric plant to be installed in completely enclosed compartments in a space just slightly larger than the unit and its accessories, with allowances for an air-intake vent and exhaust outlet.

Rated 13.5 to 14-hp at 1,800 rpm, the new diesel engine features removable cylinder barrels. These separate cylinders are replaceable with standard bore size (3½-in. bore, 3½-in. stroke) cylinders making overhaul operations simple and comparatively inexpensive.

Both generator and control for the DRN units are completely Onan-built. The single ball bearing, four-pole, revolving armature type, self-excited generator is directly connected to the diesel engine by a semi-flexible drive disc to assure permanent, positive alignment. The generator is rated at 6 KW AC. Single and three-phase units are rated at unity power factor.

The Onan control, enclosed in a self-contained cabinet, is mounted on top of the generator. It contains a battery charge rate ammeter, oil pressure gauge, heater switch and start-stop switch.

NEWS ABOUT THE DUMP BODY BUSINESS

Performance Bonus!

MARION BODIES AND HOISTS

Six Marions Provide Big Daily Payloads On Double-Duty Fill Dirt-Coal Hauling Jobs

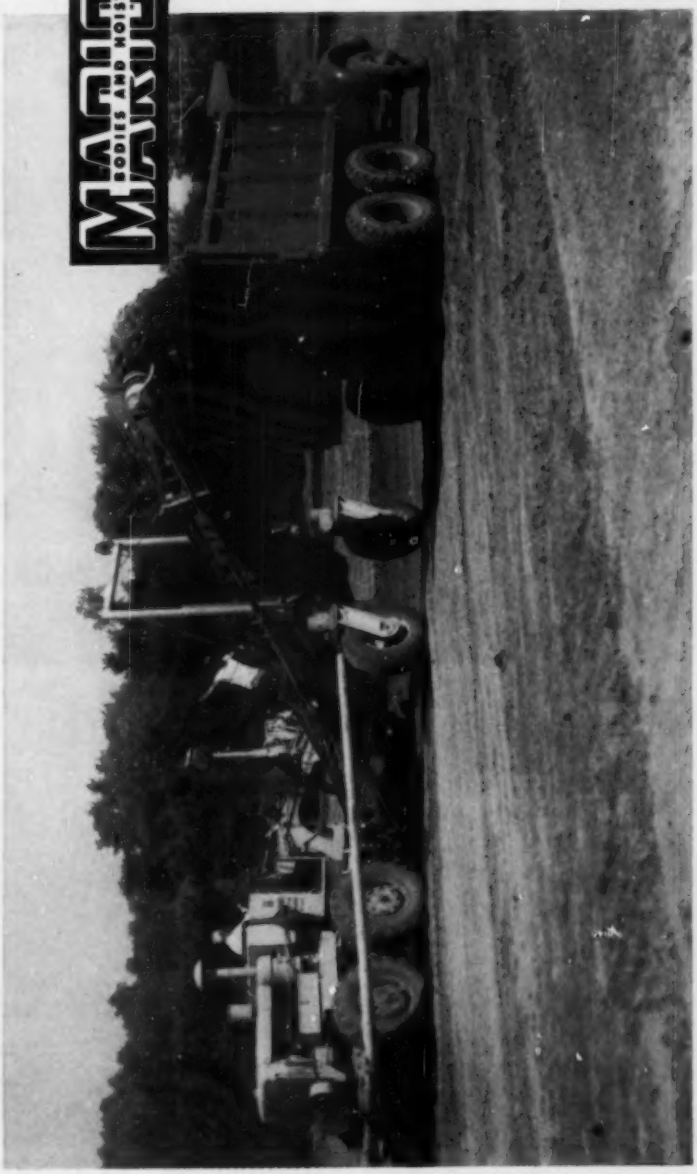
Since May, 1958, six Marion 13 cubic yard bodies have been performing double-duty for Frank Murphy Trucking of Zanesville, Ohio. On days when the weather prevented hauling dirt for building an overpass on highway 16 in Newark, Ohio, the units were kept busy hauling coal.

The owner, Frank Murphy, has been well pleased with the continuous operating dependability and efficiency of the units during these nine months. On the road building job, each truck has maintained a high daily payload rate of 450 yards of dirt during each 10-hour shift. Each unit makes 40 to 50 of the 1½-mile round trips a day. The Marions are loaded in 30 to 40 seconds with a grader-conveyor.

The 13 cubic yard bodies are raised with a Marion front telescopic hoist Model LF-614-T-120.

Get all the facts on Marion bodies and hoists for construction . . . quarrying . . . mining . . . all your hauling requirements.

MARION METAL PRODUCTS CO.
Marion, Ohio, U.S.A.



NEW CAT DW20 4-wheel, 345 HP Series G Tractor with 24 cu. yd. No. 482 Scraper

NEW CAT DW21 2-wheel, 345 HP Series G Tractor with 19.5 cu. yd. No. 470 Scraper

NEW CAT No. 619 2-wheel, 225 HP Series B Tractor with 14 cu. yd. No. 442 Scraper

BIG NEW CAT WHEEL RIGS CUT PRODUCTION COSTS

You name the job...these new Cat Wheel Tractors and matching LOWBOWL Scrapers can do it better with faster cycles and greater production, at lower cost. For example:

DW20-DW21 Series G Tractors and matching LOWBOWL Scrapers Now these big wheel tractors develop 345 HP—an increase of 8% over former units. Both tractors have 12% more rimpull than before—the DW20 develops 39,565 lb. (maximum) rimpull, and the DW21 has 49,100 lb. (maximum) rimpull. As a result, the new rigs travel faster (up to 20%) under similar haul road conditions. To accommodate this greater power and capacity, improvements have also been made in transmission and final drive.

Matching the increased horsepower and productivity of the Series G Wheel Tractors are the new No. 456 and No. 470 Series B LOWBOWL Scrapers. Rating is increased 8% to 19.5 cu. yd. struck and 27 cu. yd. heaped. (Rating on the No. 482 is 24 cu. yd. struck and 34 cu. yd. heaped.) Bowl, draft frame and apron are strengthened for greater resistance to tough materials and rugged loading—withstand higher loading stresses.

No. 619 Series B Wheel Tractor and No. 442 Series B LOWBOWL Scraper Here is the latest addition to the Caterpillar line of high-speed earthmoving equipment. This brand-new earthmover is a 14 cu. yd. struck (18 cu. yd. heaped) unit featuring ground-hugging roadability, "years ahead" service-accessibility, and high productivity. The No. 619 has a turbocharged 225 HP engine (and high torque rise), planetary final drives, unit construction, tubeless tires, a swing-away dash, 2-jack steering, and a dry-type air cleaner, providing the design and performance features that insure superior workability on a broad range of applications. All this in the new No. 619-No. 442 unit—plus proved economy over any earthmover of comparable size.

DW15 Series F Wheel Tractor and No. 428 LOWBOWL Scraper Greater strength and productivity in the well-known four-wheel DW15-No. 428. Bevel gear and pinion, differential and front wheel spindles offer increased service life. Machine delivers 200 HP. The big LOWBOWL Scraper handles 13 cu. yd. struck, 18 cu. yd. heaped. Can be unhitched to haul other units.

Plan your work around these new Cat Wheel Rigs for top production at lowest cost: The DW20-DW21 Series G, the new No. 619 and the DW15 Series F. The complete facts are at your Caterpillar Dealer. Call him today for a demonstration.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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BORN OF RESEARCH
PROVED IN THE FIELD

New Trade Literature

Subject: **Payscrapers, Paywagons**

Content: A 36-page catalog details the new International model 495 Payscraper and model 495 Paywagon. Among Payscraper features are 34-yd. heaped and 24-yd. struck capacities; a 375-hp IH diesel engine; 35.7-mph top speed; 131-in. cutting width; and 98-in. high apron opening with positive ejection. The 495 Paywagon has a heaped capacity of 40.5 yards and a struck capacity of 27 yards. It also has a 375-hp IH diesel engine and a maximum speed of 35.7 mph.

Where to get: International Harvester Co., Department EE, 180 N. Michigan Ave., Chicago 1, Ill.

Subject: **36-In. Crusher**

Content: Mechanical features of the 36-in. Hydrocone crusher are described in a 4-page bulletin released by Allis-Chalmers. Available with instantaneous hydraulic adjustment for wear and product size, the crusher can be had with fine, intermediate or coarse crushing chambers. Affording big machine advantages, the crusher is only 4 feet 10 inches high. The coarse crushing chamber has a 7-in. opening, the intermediate is 4-in. and the fine 2-in. Tables of approximate capacities are listed. Ask for bulletin 17B 9296.

Where to get: Allis-Chalmers Mfg. Co., Department EE, Milwaukee 1, Wis.

Subject: **Heavy Construction**

Content: *Handbook of Heavy Construction* is a convenient reference work on earthmoving, concrete, steel erection, highways, foundations and other areas of heavy construction. The 1,040-page volume, containing over 600 illustrations, has been prepared by a staff of noted specialists. Editor-in-chief is Frank W. Stubbs, Jr., professor of civil engineering at Purdue University. Chapters discuss excavators, tunnels, explosives, dewatering, pneumatically applied concrete, precast and prestressed concrete, intrusion grouting, electric-arc welding, timber construction, bituminous pavements, pipelines, cofferdams and caissons, pile driving, river diversion, construction contracts, safety, contractor's organization and other topics. Price is $18.50.

Where to get: McGraw-Hill Book Co., Department EE, 327 W. 41st St., New York 36, N. Y.

Subject: **Moto-Crane**

Content: An 8-page bulletin describes the new 18-ton Lorain Moto-Crane model MC-218. The crane is mounted on a 6 x 4 carrier with two-position turntable mounting, hydraulic power steering, power brakes and integrally-welded outrigger boxes. Some turntable features covered are one-piece truss reinforced bed; compact clutch shaft assembly; power load lowering; and anti-friction bearings.

Where to get: Thew Shovel Co., Department EE, Lorain, Ohio.

Subject: **Hydraulic Hose**

Content: A practical every-day guide for hydraulic hose users has just been issued by Hydraulics, Inc. In a 16-page catalog form, this booklet outlines specifications for low to high pressure hose. Detailed thread and fitting information is included for both the permanent and reusable types of couplings.

Where to get: Hydraulics, Inc., Department EE, 40 Lafayette St., Newark 2, N. J.

Subject: **Alloy Castings**

Content: A 36-page, four-color booklet describes the role of molybdenum in heat-treated low-alloy steel castings. Entitled *The Role of Molybdenum in Steel Castings for Industrial Equipment*, the brochure is published by Climax Molybdenum Co. It discusses hardenability, tensile properties, fatigue, hardness, wear and impact resistance, machinability and weldability of cast steels. Well planned tables, graphs and charts substantiate the text. A special illustrated section of the booklet is devoted to castings used in earthmoving equipment. Crawler-crane shoes; hitch blocks; dipper and bucket points; rock wagon king-pins; and front and rear axle housings are among the many case histories cited.

Where to get: Climax Molybdenum Co., Department EE, 500 Fifth Ave., New York 36, N. Y.

Subject: **Power Shift Transmission**

Content: Working details and mechanical relationships of an industry "first," the Caterpillar Power Shift transmission are explained in an illustrated three-color booklet. Making use of exploded and schematic drawings, the booklet shows the flow of power from the engine through the two sets of planetary gears and the torque converter. Also explained is how the best features of both direct drive and torque converter equipped tractors are utilized to obtain higher efficiencies and greater production. Another prime advantage of the system, as pointed out in the booklet, is the ability to positively, quickly shift gears. A gear selection lever is mounted next to the operator's left arm rest. Positive spring action releases the clutch discs affording instant change of direction. Power Shift transmissions are available for both the D9 series E and D8 series H tractors. Ask for form 33403.

Where to get: Caterpillar Tractor Co., Department EE, Peoria, Ill.

Supervising Authority: Federal Aviation Agency; *Contractor:* C. J. Langenfelder & Son, Inc.

Bethlehem Wire Rope at Washington's New Dulles International Airport. On a 9,400-acre site at Chantilly, Va., about 23 miles west of Washington, D. C., some 11 million cu yd of earth and rock are being moved to make way for Washington's new airport. Upon completion in 1961, two 11,500-ft north-south runways, and one 10,000-ft east-west runway, each 150 ft wide, will be able to handle jet traffic with ease.

Bethlehem wire rope gets a real workout on much of the busy earth-moving equipment at Dulles. Here it is turning in the same reliable performance for which it is so well known wherever construction is in progress.

Bethlehem Steel Company, Bethlehem, Pa. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem wire rope

BETHLEHEM STEEL

WHICH OF THESE 3 USED EQUIPMENT BUYS IS BEST FOR YOU?

Only your Caterpillar Dealer offers you these three protected buys on used equipment. Which is best? That depends on how you want to use a unit and what you want to pay. Whatever you want, you'll find it in his lot.

1 **A "BONDED BUY"** on used Cat-built equipment is your safest buy. A bonded guarantee, up to $10,000, of satisfactory performance on *all* parts is given when you purchase a "Bonded Buy" used Cat-built machine.

2 **A "CERTIFIED BUY"** covers units of any make in good condition. This type of protection carries your dealer's written guarantee of satisfactory performance.

3 **A "BUY AND TRY"** deal is just what its name implies. This protects you with your dealer's written money-back agreement.

You *know* what you're buying from your Caterpillar Dealer. You'll find him listed in the Yellow Pages. Visit his Used Equipment headquarters for the best buys in the market!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

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BEST BUYS IN NEW AND USED EQUIPMENT

Costa Rica . . .

Continued from page 21

and supervises the several field offices.

The sponsoring partner of the joint venture is Foster Construction, S.A. of Costa Rica, which is a subsidiary company of Foster Construction, C.A. of Venezuela. This is the first job for Foster Construction in Costa Rica. However, the company has been doing business in Venezuela since 1946, and is still actively engaged in work there for major oil companies as well as the Venezuelan government.

Company President Grant Foster is a veteran of more than 20 years of construction work in Latin America. Other stockholders are U. S. citizens, Venezuelans and Costa Ricans.

World-wide Activities

BACKGROUND of the Williams Brothers firm is an interesting success story.

The history of the firm began over 50 years ago, when two young brothers, employed as construction workers decided to strike out for themselves. Without much in the way of assets and using borrowed tools, they started a small building business in 1908, and soon graduated to more challenging construction activity. At the start of World War I, when United States oil was desperately needed overseas, they built one of the early domestic crude oil pipe lines. After the war, the Williams brothers devoted themselves principally to this type of construction, until today the name of the company is well known wherever petroleum pipeline operation exists. In 1956, the firm passed the mark of 50,000 miles of pipe laid; 1957 and 1958 added another 6,000 miles.

Williams Brothers had found that proficiency in nearly all fields of construction is required of the present day pipeline builder. In order to undertake the construction of varied installations for the petroleum transportation and utility industries, the firm maintains a separate team of supervisors, engineers and administrators for these general construction assignments. This staff is devoted to the engineering and building of concrete, electrical, mechanical and structural work, and operates independently as the General Construction Division.

Although this division is occupied to a major extent with work supporting the company's pipeline construction activities it solicits certain type of general construction work, especially in foreign areas. This represents no departure from the established policy of Williams Brothers to concentrate its work in the pipelining field. Instead it is the result of a desire to make those special services more effective.

Current Work

The building of all-weather access roads to new oil fields is carried out continually in foreign countries. In Turkey, road building by Williams Brothers is opening up new exploration areas. In Indonesia, 200 miles of road are being built as part of an oil development there.

In Paraguay, Williams Brothers is acting as a service unit to Pure Oil Co. of Paraguay in the construction of oil field roads. Over 270 miles of all-weather road have been recently completed along with 175 miles of exploration trails and 10 airstrips.

Officers of the company include John H. Williams, president; Charles P. Williams, executive vice president; and David R. Williams, Jr., executive vice president. Marvin Jones, senior vice president, is in charge of foreign operations and Maurice B. Kite is vice president in charge of General Construction.

OFFERED AT REDUCED PRICES FOR PROMPT SHIPMENT AND SUBJECT TO PRIOR SALE

ITEM	SIZE CU. YD.	DESCRIPTION	WT.	REG. PRICE	REDUCED PRICE
1	⅜	• DRAGLINE BUCKET, COMPLETE Type AX, Medium Duty S	950#	$ 710	$ 600
2	⅝	• DRAGLINE BUCKET, COMPLETE Type BL, Light Duty PS	1200#	865	700
3	⅞	• DRAGLINE BUCKET, COMPLETE Type BM, Medium Duty PS	1750#	1190	1000
4	⅞	• DRAGLINE BUCKET, COMPLETE Type BM, Medium Duty S	1750#	1190	900*
5	2	• DRAGLINE BUCKET, COMPLETE Type BL, Light Duty PS	3200#	2175	1900
6	2	• HENDRIX DRAGLINE BUCKET, COMPLETE Type TS, Medium Duty P	3550#		1500*
7	2½	• DRAGLINE BUCKET, COMPLETE Type BL, Light Duty PS	3850#	2600	2300
8	3	• DRAGLINE BUCKET, COMPLETE Type BL, Light Duty PS	4300#	2905	2500
9	3	• DRAGLINE BUCKET, COMPLETE Type BM, Medium Duty PS	4650#	3045	2350*
10	3¼	• DRAGLINE BUCKET, COMPLETE Type BM, Medium Duty S	5100#	3340	3000
11	3½	• DRAGLINE BUCKET, COMPLETE Type BM, Medium Duty S	5550#	3610	2730*
12	4	• DRAGLINE BUCKET, COMPLETE Type BL, Light Duty P	5400#	3620	3200
13	4½	• DRAGLINE BUCKET, COMPLETE Type BM, Medium Duty S	7650#	4970	4400
14	4½	• DRAGLINE BUCKET, COMPLETE Type BH, Heavy Duty S	8600#	5505	5000

*Used buckets. All others are new. P — Perforated S — Solid

• List prices F.O.B. Evansville, Indiana Works. Subject to regular cash discount 2%, 30 days from date of shipment.

• When ordering, give size of dragline and hoist line so that correct sizes of rope sockets can be included.

• Immediate shipment subject to prior sale.

BUCYRUS ERIE ®

BUCYRUS-ERIE COMPANY • Parts Division • South Milwaukee, Wisconsin

TO ADVERTISE: All advertising in this section is payable in advance. Rate: $1.00 per line, or $12.00 per inch of 12 lines. Minimum charge $4.00. No discounts; no commissions. Please count your copy carefully to avoid delay. Each line contains 41 characters (34 characters is all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Be sure to enclose the correct amount of money with your order. Closing date—10th of preceding month. Example: January closes December 10th.

TO INQUIRE: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

LARGE SHOVELS, CRANES, DRAGLINES — 3 YDS. & UP

HEAVY EXCAVATION EQUIPMENT

Draglines—Shovels—Cranes—Drills—Trucks

15-W Bucyrus-Erie elec. drag, 215', 13-yd.
9-W Bucyrus-Erie elec. drag, 160', 11½-yd.
9-W Bucyrus-Erie diesel drag, 200', 9-yd.
7-W Bucyrus-Erie elec. drag, 140', 7-yd.
7-W Bucyrus-Erie diesel drag, 140', 7-yd.
7400 Marion diesel drag, 175', 13-yd.
7400 Marion elec. drag, 175', 12-yd.
625 Page diesel drag, 160', 9-yd.
360-M Marion elec. drag, 175', 8-yd.
621-S Page diesel drag, 125', 7-yd.
200-W Bucyrus-Erie diesel drag, 125', 6-yd.
5-W Bucyrus-Erie diesel drag, 100', 6-yd.
2400 Lima dragline, 130', 5-yd.
4500 Manitowoc drag, 120', 5-yd.
120-B Bucyrus-Erie elec. drag, 115', 5-yd.
3900, 3500 & 3000 Manitowoc cranes.
111-M Marion drag, 100', 4-yd.
1601 Lima 4-yd. shovel/drag.
1055 P&H drag, 80', 3½-yd.
1201 Lima dragline, 85', 3-yd.
54-B Bucyrus-Erie drag, 80', 2½-yd.
5560 Marion 26-yd. elec. shovel.
750-B Bucyrus-Erie 20-yd. elec. shovel.
5480 Marion 18-yd. elec. H. L. shovel.
151-M Marion 7-yd. elec. shovel.
170-B Bucyrus-Erie 6½-yd. elec. shovel.
4161 Marion 6-yd. elec. shovel.
2400 Lima 4½ and 5½-yd. H. L. shovels.
120-B Bucyrus-Erie 4-yd. elec. shovel.
111-M Marion 4-yd. standard shovel.
1201 Lima 3½-yd. standard shovel.
54-B Bucyrus-Erie 2½-yd. standard shovel.
Large selection of smaller shovels & draglines.
Model T-650 Reich heavy truck mounted rotary and down-the-hole drill.
Euclid trucks—rear and bottom dump.
Truck cranes, dozers, scrapers, attachments.

FRANK SWABB EQUIPMENT CO., INC.
313 Hazleton Nat'l Bank Bldg.
Hazleton, Pa. **GLadstone 5-3658**

Euclids—Rear, Botton and Scrapers

12-yd. Bucyrus-Erie dragline.
9-yd. Bucyrus-Erie dragline.
6½-yd. Bucyrus-Erie shovel.
4-yd. Bucyrus-Erie shovel.
4-yd. Bucyrus-Erie dragline.
2½-yd. Bucyrus-Erie shovel and dragline.
5-yd. Manitowoc dragline.
6-yd. Lima dragline.
Other equipment available, not listed above.

WILLIAM LUBRECHT, III
Construction Equipment
211 W. Diamond Ave. **Hazleton, Pa.**
Phone: GLadstone 5-4041 or 5-0253

LARGE SHOVELS, CRANES, DRAGLINES — 3 YDS. & UP

1—Bucyrus-Erie model 175-B dragline, electrically driven with 125 foot boom and 5-yd. bucket. Travels on rails and mats. Considerable spare parts also available. Contact Mr. J. N. Becker, at

POLK EQUIPMENT CO., INC.
P. O. Box 1016 **Bartow, Fla.**

Bucyrus-Erie 200-W diesel walking dragline, 125-ft. boom, 5-yd. bucket. S/N 762. Cooper-Bessemer FW-6 engine and complete electric light plant. Location western Pennsylvania.

EXCAVATING ENGINEER
Box 3750
South Milwaukee, Wisconsin

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Bucyrus-Erie Hydrohoe attachment for H-3 Hydrocrane complete with 18" general purpose dipper, 20" utility dipper, 12" narrow dipper and all necessary fittings. Excellent condition. Complete $750.
Bucyrus-Erie model 15-B backhoe, serial No. 116605 with Caterpillar D315 diesel engine, wide treads, extended crawlers. Outstanding condition.
Caterpillar DW21 series C, Motor Scraper, serial No. 69C1774. 29.5 x 29—22 ply tires. Machine never used. Outstanding value.
Lorain model TL-25, serial No. 19697, backhoe. Machine completely rebuilt $9,500.
Northwest model 25, serial No. 16381, backhoe with D318 Caterpillar diesel engine. Good condition.
P&H model 150, serial No. 13833—½-yd. backhoe with gasoline engine.

BINDER MACHINERY CO.
Brighton St. **Union, N. J.**
MUrdock 8-0060

Bucyrus-Erie 22-B dragline, serial No. 94162. Has 40' boom, GMC diesel engine, long-wide tracks. This machine is in excellent condition.
Bucyrus-Erie 22-B dragline, serial No. 71073. Has standard tracks, GMC diesel engine, 40' boom. Very good condition. Ready to go.
Insley K-12 with gasoline engine. Has 9'11" crawlers, 15" track shoes, 40' boom, fairlead and ½-yd. back hoe attachment. Just overhauled, cleaned and painted.
Insley K-10 with gasoline engine. Has 9'11" crawlers, 15" track shoes, 30' boom, fairlead and tagline reel. Also has ½-yd. hoe attachment. Good condition.
Insley K-14 with gasoline engine. Has 45' boom and 5' jib, tagline reel, 11'7" crawlers, 24" track shoes. Also has ¾-yd. hoe attachment. Cleaned and painted. Good condition.
Lorain model 25 dragline and lifting crane. Has standard tracks, 40' boom, new GMC diesel engine. Balance of machine is in fair condition.
Bucyrus-Erie 38-B combination crane, clamshell and dragline. Has long-wide tracks, 60' boom, Caterpillar D13000 diesel engine. Very good condition.
Three Allis-Chalmers model TS360 motor scrapers, 15-yd. struck capacity, 20-yd. heaped. These machines have been used very little since rebuilding and are in excellent condition. All latest factory changes have been made.
All of the above equipment is located in the Chicago area and is offered subject to prior sale.

D. D. KENNEDY, INC.
P. O. Box 177 **Bellwood, Ill.**
Chicago phone—AUstin 7-4300

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Backhoes

1—Michigan C-16 ½- yd. backhoe, ½-yd. 22" bucket, 9'9" crawlers, 20" wide, Hercules gas engine JXD #1742230, machine #3797, 4 years old.
1—Koehring 303—¾-yd. backhoe, 30" bucket, 10'6" crawlers, 24" wide, Waukesha gas engine #484150, 4¾"x5¼", serial #2337.
1—Osgood 200 ½-yd. backhoe with 22" bucket, 11' crawlers, 22" wide, powered by Continental gas engine, machine #6285, 5 years old.
1—Lorain model TL-20 backhoe, with Waukesha gas engine, six years old, good condition.

Draglines

1—Unit model 614 dragshovel, ½-yd. bucket, 20" pads, GM diesel 2055, good condition, 6 years old, serial #52147.
1—Unit model 614 dragshovel, ½-yd. bucket, 20" pads, GM diesel 2055, excellent condition, 4 years old, serial #54308.

Air Compressors

1—LeRoi 315 air compressor on 4 pneumatic tires, 7 or 8 years old.
1—Joy model WK-80, size 105 portable air compressor with gas engine.
1—Gardner-Denver 105 CFM, 2 stage water cooled air compressor, Hercules OXD-5 gas engine with electric starter on 2 pneumatic tired wheels, serial #162853.

Misc.

1—Bucyrus-Erie 15-B ½-yd. shovel attachment perfect.
1—Schield Bantam 30-ft. crane boom.
1—Wiley PM215 Patchmobile portable asphalt patching unit on two pneumatic tires, complete with rotary dryer. This unit is new.
1—Ruhr M-1 ½-yd. heavy duty grapple, new, excellent buy.
1—Wayne 36" rider industrial vacuum pick-up power sweeper, demonstrator, 2 years old.
2—CMC Jetcretes with all accessories. Excellent condition, practically new with all extra accessories.
1—Baker 3300 gallon tank trailer, single axle.
1—Ross 6-ton pneumatic tired fork lift truck. 10' mast, 14' lift.
1—Used Kennedy Van-Saun Revolving scrubber washer screen, 48" dia. x 21'0" long, in excellent shape and complete with all new parts including extra scrubber sections and new sizing screens.
1—Ford 1956—F-600 stake body truck, serial #F602N14988, air brakes, heavy duty dump hoist, 2 speed rear and oversize motor.

S. M. CHRISTHILF & SON, INC.
Timonium Rd. & Harrisburg Expressway
Timonium, Md. **VAlley 5-5100**

H-2 magnet crane, serial #81118 mounted on International L-152, serial #76461, equipped with 24" magnet & SKW generator. Machine as is, in operating condition, price complete $5,000.

MOTT-MANBECK MACHINERY CO., INC.
Latham, N. Y.

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1 Northwest 80-D shovel and dragline.
2 Northwest No. 8 draglines.
1 Marion 151-M 6-yd. shovel.
1 Marion 4161 dragline equipped with 120' boom and 5-yd. drag bucket.

EXCAVATING ENGINEER
Box 3744
South Milwaukee, Wis.

Model 25 Northwest diesel shovel and pull shovel. GMC diesel engine. Serial No. 7723. Located in Seattle.
Model L-41 Lorain hoe with Waukesha gas engine. Serial No. 17832.
One 38-B straight boom 1½-yd. hoe attachment.

CLYDE EQUIPMENT CO.
3410 First Ave. So. **Seattle 4, Wash.**

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Excavators

1—Lima 604 shovel, powered by Cummins H1S diesel engine. There is a lot of production left in this machine and it is priced for a quick sale. Located at Casper, Wyo.

1—Bucyrus-Erie 22-B, equipped as a backhoe powered by Cat D318 engine. The number of machines just like this working in the area prove the quality.

1—Model L Quickway equipped as a backhoe mounted on a Federal truck. We shop checked machine and minor repairs were made.

1—Osgood dragline model 304 equipped as a dragline powered by GM diesel engine. This machine operates.

1—Bucyrus-Erie 10-B, powered by Hercules gas engine, equipped with a backhoe. An older machine that still operates.

1—Link-Belt LS71 equipped as a dragline powered by Int. UD14A engine, 45′ boom with pendant suspension—A very clean machine.

Tractors

1—Caterpillar model D9, equipped with Push block, front power control unit. Machine has new rails, rollers and sprockets rebuilt. This tractor was new in June 1958—A near new tractor at a used price.

1—International TD24, straight dozer and B-E double drum power control unit. You will like both the price and the looks of this tractor.

1—Allis-Chalmers HD-19, 26″ grouser shoes, front pusher plate, rear pusher block—we have shop checked this tractor.

Trucks & Scrapers

2—Caterpillar model DW20 scrapers model 21C's. Compare the condition and price of these scrapers before you buy.

2—Allis-Chalmers TS200 scrapers—The previous owner had rebuilt these machines just before he traded for Twin powered 24-yd. Euclid scrapers. Located at Casper, Wyo.

1—Euclid model 7 equipped with 18:00x25 16-ply tires. The right size for housing developments, land leveling or industrial applications.

Crusher & Asphalt Equipment

1—Pioneer paver model BP11—A near new paver with all of the latest modifications.

1—Pioneer 81 asphalt plant—This plant is complete including piping and tanks—It was delivered new in 1955 and the most discriminate buyer will appreciate the condition of this plant.

THE COLORADO BUILDERS' SUPPLY CO.
1534 Blake St. Denver 2, Colo.

At Dallas, Texas

Bucyrus-Erie 15-B dragline ½-yd. bucket, S/N 72928, fair condition.

Bucyrus-Erie 22-B combination clamshell excavator, 45′ boom, extra counterweight, tractor type tracks, Cat D318 engine, ¾-yd. Blaw-Knox clamshell bucket, S/N 114274, excellent condition.

P&H dragline w/bucket, S/N 59060, fair condition.

Lorain model 41 dragline, S/N 14432, good condition.

Northwest model 25 dragline, S/N 11313, 40′ boom, GM diesel, reconditioned.

Insley K-13 backhoe, S/N 55690, good condition.

Insley K-12 dragline, 35′ boom, U-9 IHC gas engine, ¾-yd. bucket, S/N 1801, reconditioned.

Dragline boom K-12 Insley, excellent condition.

Marion 362, 1½ shovel and dragline, Murphy diesel, S/N 8488, good condition.

Shovel attachment for 10-B Bucyrus-Erie, fair condition.

Backhoe attachments for T-35 Schield-Bantam LS-50 Link-Belt; Marion 362, 1½-yd.

At Houston, Texas

Bucyrus-Erie 15-B backhoe, IHC UD-9 engine, tractor type tracks, S/N 59821, reconditioned.

Bucyrus-Erie 22-B backhoe, ¾-yd. Esco bucket, IHC UD-525 engine, rebuilt.

Quickway E dragline, 25′ boom, IHC UD-9 mounted on IHC L-184 tandem axle (single drive) truck S/N 5560, reconditioned.

Bucyrus-Erie 22-B dragline, 45′ boom, pendant suspension, IHC UD-14 engine, S/N 56343.

Schield-Bantam C-35 dragline, Continental 6-cyl. gas engine, 30′ boom, 16″ shoes, ¾-yd. Page bucket S/N 6377.

Lorain TL-25, ¾-yd. backhoe, Cat 315 engine, 22″ shoes, S/N 23276.

2—10′ boom inserts for standard Bucyrus-Erie 22-B.

Hoe attachment (straight boom) for Bucyrus-Erie 15-B.

2—Hoe equipment w/¾-yd. Esco bucket, straight or cambered boom.

BROWNING-FERRIS MACHINERY CO.

Dallas — **305 Exposition Ave.** — **TA-3-8121**
Houston — **2619 Texas Ave.** — **CA-5-3231**

SMALL SHOVELS, CRANES, DRAGLINES — UP to 2½ YDS.

⅜-yd. model 315 Unit wagon crane, equipped with 30′ crane boom, tagline reel, ¾-yd. Owens clamshell bucket, good condition.

½-yd. model H-3 Hydrocrane, mounted on 6 wheel drive truck chassis, including reel and bucket. Hydrocrane is 1955 and upper works powered with 4-cylinder Ford industrial engine.

¾-yd. model 22-B Bucyrus-Erie crawler mounted shovel (1949) equipped with Cat D-4600 diesel engine, standard crawlers. Also available with crane or hoe equipment. Overhauled and in very good condition.

¾-yd. model 375 American crawler mounted shovel (1949) equipped with Waukesha gas engine, standard crawlers, ¾-yd. shovel dipper. Priced at $3,500.

¾-yd. model 375 American crawler mounted dragline, equipped with series 3-71 GMC diesel engine, long crawlers, standard boom, dragline fairlead. Good condition.

¾-yd. model 34 Lima crawler mounted crane-clam-dragline-hoe combination, equipped with gas engine, 35′ crane boom, fairlead, tagline reel, hoe boom with dipper.

¾-yd. model 83 Byers crawler mounted crane-dragline (1950) equipped with long wide crawlers (30″ treads) 40′ boom, dragline fairlead, good condition and priced to sell.

1-Yd. model 55 Lorain shovel, crawler mounted UD-18 IHC diesel engine, has been partially overhauled, complete with 1-yd. shovel dipper. Special close out price at our yard $2,500.

1½-yd. model 604 Lima crane-dragline combination (1951) equipped with Cummins diesel engine, long wide crawlers, 80′ boom, dragline fairlead, good condition and priced to sell.

2-Yd. model 820 Lorain crane-clam-dragline, equipped with 80′ of boom, Cat D13000 diesel engine, tagline reel, dragline fairlead, Alemite pressure lubrication system, long wide crawlers. Very good condition. Check this special price.

Truck Cranes

15-Ton Browning truck crane mounted on Mack crane carrier, 11.00x24″ tires, 6x4 drive, 80′ pendant suspended boom, independent boom hoist, live down, 15′ jib, priced to sell.

15-Ton Bay City truck crane, equipped with lots of erection crane features, 70′ pendant suspended boom, fairlead, very good condition. Must be seen to be appreciated.

35-Ton model 30-B Transit Crane demonstrator, equipped with 130′ boom, GMC diesel 4-71, Waukesha engine (gas) on carrier, machine has several of the new features found on the new 45-ton truck crane. Will carry a new machine warranty. Better than $20,000 can be saved on this truck crane.

Gradall multi-purpose excavator, Warner & Swasey model 2460 new in 1957, equipped with GMC series 3031-C diesel engine on the upper works; mounted on 6x4 duplex carrier, 24″ and 36″ digging buckets and frost ripper included. Machine in good condition and priced to sell.

J. P. WAITE, INC.
3304 W. Pierce St. Milwaukee, Wis.
EVergreen 4-1900

Caterpillar model D8 diesel tractor, serial 2U-20641SP, equipped with Gardner-Denver model WH600 tractor mounted compressor, Gardner-Denver model JMA hydraulic pump, Gardner-Denver model JTB tripod type boom, two (2) Gardner-Denver model D99DT derrick type drill. Gardner-Denver chain feed mountings, with 7″ cone for 12 foot steel changes electric starting, crankcase guard, dry type air cleaner. Machine in excellent condition. $24,500.

Caterpillar model D7 diesel tractor, serial 3T-16033, equipped with Caterpillar model 7A angle blade bulldozer, Caterpillar model 24 front mounted single drum cable control. 20″ grouser tracks, electric starting, track roller guards, dry type air cleaner. This machine is in good condition. $15,500.

Caterpillar model D6, 72″ diesel tractor, serial 9U-1227, equipped with 1958 model Caterpillar 46 front mounted hydraulic control, new Caterpillar model 6A hydraulic controlled angle blade bulldozer, electric starting, crankcase guard, 20″ grouser tracks. Good Condition. $12,750.

Caterpillar model D4 diesel tractor, serial 7U-25463-SP, equipped with Caterpillar model 4S hydraulic controlled straight blade bulldozer, Unimatic model CW-4 ditcher with 10″ wide digging buckets, 20″ wide discharge conveyor, all hydraulic, counterweight box. Tractor is equipped with elec. starting, 16″ wide grouser tracks. Machine in good condition. Price on application.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Essick model 800 (5-8 ton) tandem road roller, serial U-3536, equipped with 53″ dia. x 50″ wide guide roll, sprinkling system, cocoa mats, hydraulic steering, and powered by Chrysler water cooled gasoline engine. This roller like new. $6,400.

Case model LAI wheel type loader, serial No. 5223590, equipped with Lull model C-384 shovel loader, ¾-yd. material bucket, electric starting, 7:00x20 front tires, 18:00x26 rear tires. Good condition. Price on application.

Caterpillar model 70 scraper, serial 8C-1536, equipped with 16:00x20 front tires, 18:00x24 rear tires, cable controlled. Good condition. $7,500.

Hyster model D8N worm drive winch, serial WHN-72592, complete with power take-off shaft, control levers, operator guard. Good condition. $2,250.

Hyster model D8N worm drive winch, serial No. WHN-45814, equipped with cable, power take-off shaft, controls, fairleads. This winch in good operating condition. $2,300.

Austin Western model super 99 motor grader, serial 99SW-570, powered by General Motors 4-71 diesel engine, with electric starting, cab, power steering, 6-wheel steering and drive, hydraulic side shift, torque converter, lights, windshield wiper, 12 foot blade, scarifier. This machine in good condition, has low hours, a steal. $14,750.

Galion model T-500 tandem drive diesel motor grader, serial 1350, powered by Cummins model JN6BI diesel engine, equipped with cab, scarifier, torque converter, power steering, hydraulic sideshift, lights, electric starting, four wheel brakes, 13 foot blade, 14:00x24 tires front and rear. Good condition. Low hours, a bargain $9,500.

Bucyrus-Erie model 54-B crawler shovel, serial 58882, powered by Buda model 8DAS-1125 diesel engine equipped with Torcon model 3-17CR torque converter, 26 ft. boom, 18 ft. handle, 3-yd. Esco dipper bucket, low gantery, mounted on standard 36″ flat pads. Good condition. $32,500.

Bucyrus-Erie model 20-B crawler shovel, dragline combination, serial No. 16049, mounted on 20″ flat narrow cats, equipped with 18′0″ boom, 14′6″ handle, ¾-yd. dipper bucket, used Bucyrus-Erie unit 1A dragline equipment including 35′ crane boom, sheaves, rotating fairlead, digging & hoisting ropes, power boom hoist rope. Price on application.

Bucyrus-Erie 10-B shovel backhoe combination, serial No. 72711, powered by Buda model 6B-273 gasoline engine, with electric starter, mounted on 14″ flat pads, equipped with 13′0″ shovel boom, 11′0″ handle, ¾-yd. dipper bucket, 15′ straight boom backhoe attachment, ¾-yd. dragshovel bucket. Fair condition. $4,750.

Gardner-Denver model D-89D wagon drill, serial No. unknown, equipped with Gardner-Denver model D-89D hammer, serial H-736, complete with air hoses, line oiler and mounted on rubber tired trailer. Good condition. $1,500.

Gardner-Denver model WBK-2001 "500" portable air compressor, serial No. 130890, powered by Caterpillar model D13000 diesel engine, serial No. 4S-7304, all mounted on International truck with tandem axle. Fair to good condition. $7,500.

Gardner-Denver air trac carrier, serial No. 1426, equipped with RMC-10 chain fee, serial No. 221894, and Gardner-Denver model DH99J deep hole drill, serial 618, air hoses and towing tongue. Good condition. $7,500.

Gardner-Denver model WHK-2001 "500" portable compressor, serial 156079, powered by Caterpillar model D13000 diesel engine, serial 4S-11546, all mounted on four (4) 7:50x20 tires. Good condition. $6,750.

R. L. HARRISON CO., INC.
P. O. Box 1320 Albuquerque, N. M.

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1 Completely rebuilt 54-B shovel #60317. $45,000.
1 Completely rebuilt 54-B shovel #107758. $55,000.

THE W. I. CLARK CO.
Box 301 New Haven, Conn.

Bucyrus-Erie 51-B shovel equipped with 2½-yd. bucket. Powered by Buda diesel engine model 6DA-970, 36″ treads. This machine has had less than a year of work and is in top condition. Price $53,000. Subject to prior sale.

H. O. PENN MACHINERY CO., INC.
140th St. & East River New York 54, N. Y.
CYpress 2-4800

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Truck Crane

Northwest No. 25 truck crane, 40' boom, fairlead, telescoping boom stop, outriggers and floats, Dart carrier 10-11:00x20 tires and gas engine. Good operating condition. $16,000.

P&H model 150 ½-yd. truck crane, 35' boom, includes gas driven generator and controls to operate 39" magnet (does not include magnet), factory carrier with 11:00x20-14 ply tires, gas engines. Operating condition subject to inspection. $6,500.

Lima Paymaster truck crane, model E34, ¾-yd. 35' boom, powered by 6-cylinder Buda gas engine. Mounted on Mack 6x6 truck carrier. Subject to inspection. $12,000.

Shovel

Northwest 80D, 2½-yd. shovel, 30" tracks, 25' boom, 22'6" stick, Murphy diesel engine. Reconditioned—30 day guarantee. $42,500.

Tractors

Four (4) Allis-Chalmers HD-21A Turbo-charged tractors, 26" tracks, crankcase guard, track roller guards, canopy top, front pull hook, lights, push block and double drum P.C.U. Excellent condition 30 day Guar. Each $17,500.

Caterpillar D8, 24" tracks, high output engine, electric starter, crankcase guard, canopy top, and Cat 8S hydraulic bulldozer and No. 46 hydraulic control. Reconditioned 30-day bonded guarantee. $16,500.

Scrapers

Four (4) Euclid S-18 tractor-scrapers, Allison 3-speed torqmatic drive with model 28 SH 21 yd. heaped scrapers, 4-27:00x33 ply tubeless tires. Good operating condition. $29,000 each.

Six Caterpillar DW20 tractors with Cat No. 20 scrapers. 20-yd. heaped capacity. Good operating condition. $25,000 each.

H. O. PENN MACHINERY CO., INC.
140th St. & East River — New York 54, N. Y.

MISCELLANEOUS EQUIPMENT

12" Diesel Dredge

Modern 12" cutterhead dredge with Caterpillar D397 on main pump, 100KW Caterpillar generator for winding gear, cutter and service pump. Hull 24'x80'x3', ladder 53' with 5½" shaft and Amsco cutter.

PHILLIP A. RYAN
112 W. Cabrillo Blvd.
Santa Barbara, Calif.
Phone: WOodland 5-7834, 5-8903

1—2-cu. yd. type TS Hendrix medium-duty dragline bucket complete with all fittings. Weight—3,550 pounds. Reduced price—$1,500. F.O.B. Evansville, Ind.

BUCYRUS-ERIE CO.
South Milwaukee, Wis.

4—1957 Mack trucks B63-SX diesel, 12-yd. rear dump.
2—1956-1958 Ford F-800, Trailmobile tractor rear dump trailer combination.
1—Model D Allis-Chalmers motor grader.
2—¾-yd. Koehring model 304 cranes.
1—1-yd. Link-Belt LS-98 dragline new 1954.
1—HOD Hough front end loader new 1956.

Write or call for photographs or units Can be seen at

WEST SAND AND GRAVEL COMPANY, INC.
2801 Rady St. — Richmond, Va.
Phone: MIlton 4-3001

Following attachments were removed from model H-3 Hydrocrane stock: H-EQ-1 hoe equip. w/18" bucket, 20" utilities dipper with side-cutters, ⅜-yd. clamshell bucket, tagline reel, 3¼" heavy duty digging ram. Net cash price complete $2,000.

SYRACUSE SUPPLY CO.
294 Ainsley Drive
Syracuse 5, N. Y.

MISCELLANEOUS EQUIPMENT

Dredge Equipment

Booster pump unit consisting of:

16" Amsco form 44 dredge pump, including thrust and radial bearings, steel fabricated base and bearing pedestal.

500-hp, 505 rpm, G.E. wound rotor motor.

Fast flexible coupling to join 500 hp motor to dredge pump impeller shaft.

G. E. grids and resistor with drum controller for providing 25% speed reduction on dredge pump motor.

16" suction line handhole fitting for dredge pump made of manganese steel.

45 degree, 16" manganese steel elbows joined to make one 90 degree elbow for discharge line.

Section of 16" piping for carrying booster pump deck discharge line to stern of booster pump unit.

Centrifugal water pump with piping to carry water to booster pump packing gland and to side plate throat ring and packing hub flushing water entrances.

All electrical equipment is for 2,300 volt, 3 phase, 60 cycle current and included with the booster pump unit is one transformer for transforming 2,300 volt current to 440 volt current for running centrifugal water pump.

Note: All pump parts are practically new. New stone box will be furnished. Total price FOB Milwaukee, Wis. $35,000.

Call — Wire — Write
J. P. WAITE, INC.
3304 W. Pierce St. — Milwaukee, Wis.
EVergreen 4-1900

Churn drill, serial No. 26865, model 29-T equipped for drilling 6" and 9" holes, weight of 9" drill stem—2,600—3,000 lbs., jack shaft 2⅞".

Bit dresser, serial No. 26866, No. 12, complete with 1 ram die, 1 hammer die for 9" type "G" 500 lb. bits, 1 anvil, 1 pincap for 3¼"x4¼" 7 API joint on bit, bit turning handle, 2 bit gauges.

Above two items are located at Keigley Quarry Works near Payson, Utah.

Churn drill, serial No. 26107, model 29-T.

This drill is located at the Columbia Iron Mining Co., Desert Mound Mine near Cedar City, Utah.

EXCAVATING ENGINEER
Box 3749
South Milwaukee, Wis.

Unit 45 tagline reel complete with fittings, hose and guard for H-3 Hydrocrane, good cond. Price FOB Minneapolis, Minn. $150.

THE ZECO CO.
2929 University Ave. S.E.
Minneapolis 14, Minn.

3—Bucyrus-Erie 71-B tunnel front end attachments. $6,500 each. Excellent condition.

THE W. I. CLARK CO.
Box 301 — New Haven, Conn.

3—½-cu. yd. type AX medium-duty dragline buckets. Complete with all fittings. Weight—950 lbs. ea. Reduced price—$620 ea. F.O.B. Evansville, Ind.

BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.

Asphalt Plant & Equipment

Model 847 Barber Greene continuous mix portable asphalt plant, new in December, 1958. Capacity 170 tons per hour, including one Cleaver Brooks oil heater, one like new B. G. 879 asphalt finisher, two 10,000-gallon insulated asphalt tanks, one 8,000 gallon fuel tank, one 1958 10-ton Buffalo-Springfield roller, one generator set. This complete plant set up with piping and other misc. equipment priced at $127,500. Located 10 miles west of Stanfield, Ariz.

Call — Wire — Write
J. P. WAITE, INC.
3304 W. Pierce St. — Milwaukee, Wis.
EVergreen 4-1900

EQUIPMENT WANTED

H-3 old style single-ram clamshell bucket. Good operating condition. Write

CLYDE EQUIPMENT CO.
Mr. Bill Booth
Seattle, Wash.

Notes from the Manufacturers

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has elected Boyd S. Oberlink and J. L. Singleton as senior vice presidents. Oberlink joined Allis-Chalmers in 1934, and heads the A-C Construction Machinery Group. Singleton began his career at Allis-Chalmers in 1926, and heads the Industries Group.

Bucyrus-Erie Co., South Milwaukee, Wis., has authorized S. M. Christhilf & Son, Inc., Timonium, Md., to add Hydrocranes to the line of excavating and crane equipment that it distributes for Bucyrus-Erie. The Maryland firm now offers sales and service on the full line of ⅜ to 4-yd. convertible excavators and cranes; all-hydraulic Hydrocrane lifting cranes in 5 and 12-ton capacities; and Hydrocrane excavators equipped with clamshell, hoe or shovel attachment in ⅜ and ½-yd. sizes. Headquarters of the distributor are at Timonium Road and Harrisburg Expressway.

Euclid Div. General Motors Corp., Cleveland, Ohio, has begun production of two crawler tractor models at its new tractor plant in Hudson, Ohio. Located on a 400-acre site about 30 miles southeast of Cleveland, the new tractor plant is the fifth manufacturing facility of Euclid in the greater Cleveland area. Floor area of the new plant is 662,000 square feet, equivalent to 13 football fields under one roof. The firm also has a large plant in Glasgow, Scotland.

Frank G. Hough Co., Libertyville, Ill., has named David D. Hunsaker as manager of sales development. In the newly-created position, Hunsaker will be responsible for sales engineering, training aids, and merchandising programs. He was formerly a district sales manager and has been associated with Hough for almost 14 years.

H&L *Teeth that really dig*

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2669153

GIVE NEW LIFE TO YOUR DIGGING EQUIPMENT

FORGED HIGH ALLOY STEEL SHARP POINTS

Require less power – give greater production with longer digging life.

SEE YOUR H&L DEALER

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H&L TOOTH COMPANY

1540 SOUTH GREENWOOD AVE.
MONTEBELLO, CALIFORNIA

REPLACEABLE WEAR-PLATE ADAPTER

Wear-plate minimizes adapter wear. Simply replace wear-plate when worn and adapter is in new condition.

WHYTE STRAND
Wire Rope is made for a purpose...

To give you the right rope for your equipment, each Whyte Strand wire rope is internally lubricated and designed to provide the right combination of toughness, flexibility, and abrasion resistance to assure maximum service.

Because Macwhyte manufactures a thousand and one wire ropes, you can be sure of getting just the right rope for each piece of your equipment.

You get quick delivery, too, from conveniently located Macwhyte distributors' stocks. For best results, ask for recommendations for the correct wire rope to use on your equipment!

MACWHYTE *Wire Rope*

Wire Rope made for a purpose—to serve you better

MACWHYTE WIRE ROPE COMPANY • 2900 Fourteenth Avenue • Kenosha, Wisconsin

Manufacturers of shovel hoist rope, dragline, clamshell crane rope, boom hoist line, dozer rope, scraper rope, contractor's hoist and derrick rope, and winch line.

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